ENVIRONMENTAL ASSESSMENT BOARD

Ontario

ONTARIO HYDRO DEMAND/SUPPLY PLAN HEARINGS

VOLUME: 8

DATE: Monday, May 6, 1991

BEFORE:

HON. MR. JUSTICE E. SAUNDERS	Chairman
DR. G. CONNELL	Member
MS. G. PATTERSON	Member

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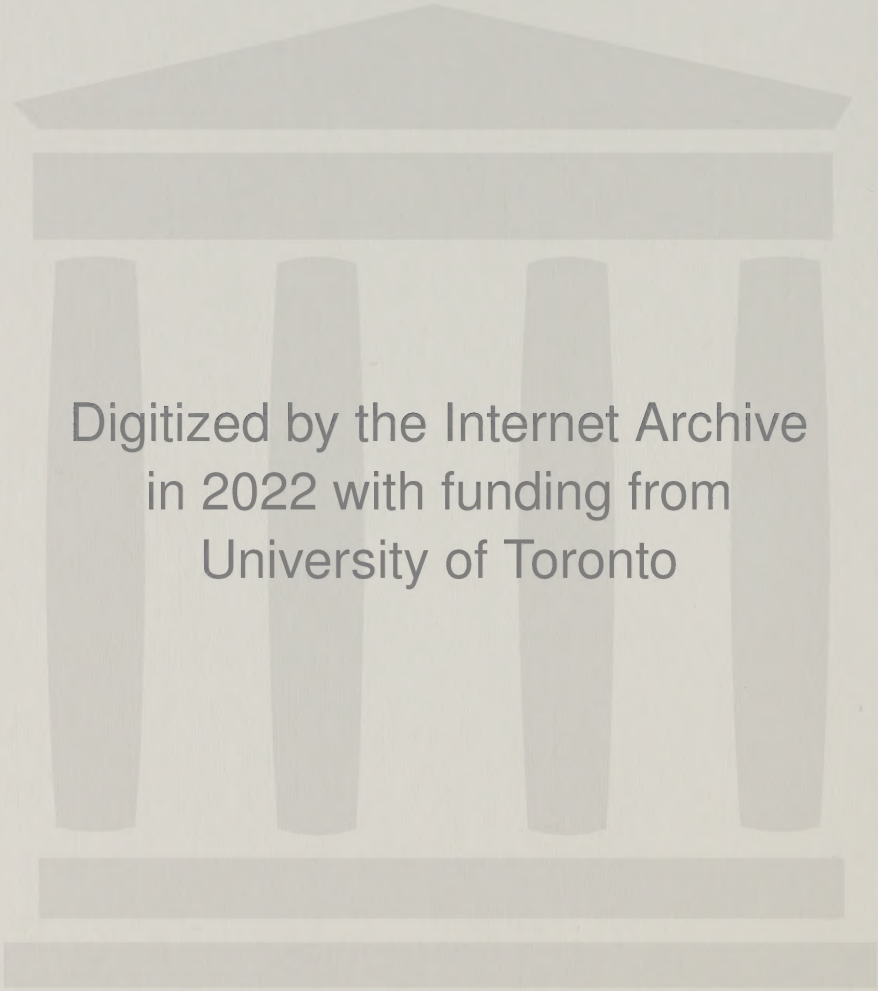

ENVIRONMENTAL ASSESSMENT BOARD
ONTARIO HYDRO DEMAND/SUPPLY PLAN HEARING

IN THE MATTER OF the Environmental Assessment Act, R.S.O. 1980, c. 140, as amended, and Regulations thereunder;

AND IN THE MATTER OF an undertaking by Ontario Hydro consisting of a program in respect of activities associated with meeting future electricity requirements in Ontario.

Held on the 5th Floor, 2200 Yonge Street, Toronto, Ontario, on Monday, the 6th day of May, 1991, commencing at 10:00 a.m.

VOLUME 8

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F. MACKESY		ON HER OWN BEHALF

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L I S T o f E X H I B I T S

---Upon commencing at 10:04 a.m.

THE REGISTRAR: This hearing is now in session. Please be seated.

THE CHAIRMAN: Mr. Poch?

MR. D. POCH: Thank you, Mr. Chairman.

MITCHELL PIERSON ROTHMAN,
PAUL JONATHAN BURKE,
LILY BUJA-BIJUNAS; Resumed

CROSS-EXAMINATION BY MR. D. POCH (Cont'd):

Q. Panel, when we left off, we were discussing the residuals in the end-use forecast, and I wanted to look at another way that the end-use forecast is or is not helpful to us in terms of DSM energy efficiency potential.

I noted that at interrogatory 1.7.23, you --

THE CHAIRMAN: 1.7.23?

MR. D. POCH: ...7.23. I don't think we have to turn these up. I will read them ever so quickly, the part that matters.

Q. You note that EEI potential is not estimated within end-use models, and this is because the current end-use models do not provide the level of detail required for this estimation.

You go on in interrogatory 1.7.24 to note that:

"Producing different scenarios of efficiency improvement would be difficult, given the coding of REEPS and COMMEND, the residential and commercial end-use models from EPRI."

And you note:

"There is little flexibility currently to introduce varying rates of efficiency improvement over time or to influence penetration rates of new technologies. The end-use models cannot be used to project the levels of demand for energy services."

And in Exhibit 1.7.33, you note that you:

"...don't track changes in the relationship between the demand for energy services..."

And that is the demand before fuel choice and so on is made,

"...and electricity in any systematic or comprehensive way."

Can I take it, then, that you don't believe it is your role to elucidate and facilitate a move towards an appropriate fuels policy, which we spoke of earlier?

MR. BURKE: A. I was trying to see the connection between the preamble and where you were leading, in the sense that... The bottom line, yes, we do not perceive it as our role to develop an appropriate fuels policy for Ontario. But also, I'd like to say that the modelling of energy services is undertaken nowhere that I'm aware of, because nobody has data on energy services, certainly at the level of detail that we use for the end-use modelling in terms of energy consumption units that we do right now.

So that, while it might be nice to know about that sort of thing, in practice, nobody does. And it is not because we don't think it is our role to look at an appropriate fuel policy that we don't do it, it is just it is not possible to do. This sort of information is not collected by anybody at this point in time in a systematic way, and certainly has not been collected historically.

Q. Mr. Burke, you are familiar with the soft energy path study that was done?

THE CHAIRMAN: I am sorry, I didn't hear that.

MR. D. POCH: Q. The soft energy path study that was done across Canada around -- post around 1980?

MR. BURKE: A. Yes, at that time I was familiar with it.

Q. And the premise of a soft energy path study is to try to match fuels and end uses?

A. Yes, but they also did not have any real data to work with. They were using some broad allocations to... You know, pure electric uses and high temperature and low temperature, for which, in fact, there is no empirical foundation. Those are numbers that have grown up in the literature to be considered acceptable, but they are not based on a survey. And certainly those are not maintained and updated to be sure that, in fact, we have a good record of the relationship between energy services and the particular fuels that are used.

Q. It is possible, is it not, to do end-use modelling in a way which allows you to change your model to make different assumptions about penetration rates or energy efficiency, market share, that sort of thing; to overcome the limitations in the EPRI model? Doctor?

DR. BUJA-BIJUNAS: A. Yes. Actually, we are currently doing that. The EPRI models we have right now, REEPS and COMMEND, which we used during the last few years to do forecasting, are being developed

further, so that we will have technology instead of detail, as opposed to more general end-use detail. And we will be able to explicitly do one of analysis somewhat more easily by allowing us to put in penetration rates, efficiencies, et cetera. So it is the next generation of REEPS and COMMEND.

Q. So is it fair to say, then, at the moment, your load forecasting, including end-use modelling, end-use forecasting, is really being used in a predictive mode as opposed to a targeting mode?

A. We put in most likely assumptions for the various parameters. So it is a predicted mode.

Q. Thank you.

MR. BURKE: A. I'd like to add that we are striving, as I think we have indicated in our documents, that we are striving to move our end-use modelling capability to the point where ultimately we would be able to produce a primary load forecast at the end-use level, as opposed to a basic-load forecast at the end-use level, as we now have it. And the modelling efforts that Dr. Buja-Bijunas was referring to are moving us in that direction.

We did quite a survey of U.S. utility modelling systems before we embarked on this work with EPRI, because we recognize that there was a need to be

able to translate end-use information to a much greater level of detail, so that it could be used for DSM impact analysis more directly.

Q. Mr. Burke, Ontario Hydro is one of the largest utilities in North America?

A. It is a large utility, yes.

Q. And you said yourself, you are one of the utilities that is helping to develop the EPRI models?

A. Well, that is my point. The state of the art is not nearly as far advanced as one might like.

Q. Indeed, this balance of power planning exercise we are going through, DSP, is pretty much unique right now, is it not, in North America? No one else is looking for a plan approval for 25 years, on the scale that we are talking about here, that you are aware of, are they?

A. Well, there are a lot of integrated resource planning exercises going on across the United States. So I don't know whether ours in some dimension or other is larger. But there are -- it is being--

Q. Well, are you aware...

THE CHAIRMAN: Please let him finish the question.

MR. BURKE: --looked at in pretty well every state. It is being looked at in pretty well every state of the United States. Whether the time horizon differs, I don't know.

MR. D. POCH: Q. How soon do you think you will be in a position to have your models at that next generational level?

DR. BUJA-BIJUNAS: A. Currently we have a working code version for the next REEPS, which still is missing some of the enhancements. Certainly, this year's forecast, the 1991 update, will be using models that are somewhat more advanced than 1990 forecast models, and hopefully, by 1992, we will have them fully in place.

But I must mention one thing. That is, the coding of software, the framework by which you can do this, some of the data requirements may not be in place to really utilize these sorts of models fully.

Q. And it may take some time, I take it, to calibrate and...

A. To build up that data, yes, that is right.

Q. Before we move on to the next area, I just wanted to ask, you don't need to turn it up, but we had asked in an interrogatory, I think it was

assigned to Panel 4, about Mr. Franklin, the president's speech to the Canadian Electrical Association, when he said it costs $52,000 or something to hook up an electrically-heated home. And we got an answer back, system planning thinks it is 15,000. Obviously, choosing a different approach to answering it.

I know that it is not your job to choose between those, but it seems to me it is going to be -- it is a very expensive part of the job that Ontario Hydro has to do. Can you or are you able to tell us how much of the load growth is for, from now till through the planning period, is for this type of heat-sensitive load that could be met, is capable of being met, by competing fuels cost effectively?

MR. BURKE: A. The cost effectively part, I think, we'll have to leave aside, but I think Dr. Buja-Bijunas will look up some numbers here on what the heat-sensitive loads that we have are.

DR. BUJA-BIJUNAS: A. I'm not sure if this is the right approach to doing it. I have some tables of numbers of, you know, total consumption in the year 2015, and how much of that is due to space heating, for example.

...

[10:15 a.m.] Q. It may be necessary for you to go away and do this, and you can inform us later. I am just interested in the change from the present and --

A. I would have to add them up over the various sectors.

Q. Would that be relatively simple to do in the coming days?

A. If what you are referring to is adding up space heating increases over the commercial and residential sectors, for example, from now until the year 2015; in other words, how much growth is ascribed to something like space heating, where there is a fuel share option, then I can do that.

Q. Okay. So you would include in that, space heating and water heating?

A. That's right, yes, for the two sectors.

Q. Could you do that for us and provide that later on?

A. Certainly, yes.

Q. Thank you.

MR. BURKE: A. Mr. Poch, before we move on, I would like to complete a statement that I was making about our review of U.S. utilities' end-use modelling capabilities, that we were undertaking prior

to pursuing our work with EPRI, and that was simply to say that when we looked at those utilities, we found that no utility, really, had a system which was capable of adequately addressing the translation of specific program information, into what we call a primary load forecast at this point. And so it was necessary to develop a new generation of models.

There are various people who have Lotus spreadsheets, and that can, for specific markets, do almost anything. But when it comes to sort of systematic, comprehensive end-use modelling approaches, there really isn't any on the market or available that does a good job of, at the sort of level that you were talking about, and that we would like to attain as well.

Q. When did you do that survey?

A. It was about two years ago, I think, before we began our contract, in the process of deciding whether we would work with EPRI on the next generation of REEPS and COMMEND.

Q. I wanted to look at just the relationship between your group and system planning. If we could turn up, first of all, page 23, slide 23, in Exhibit 107. This exhibit, we have taken the points for which we had information from your load forecasts

about energy efficiency, and this is DSM as opposed to natural, and simply graphed each load forecast over the years. And we noted that all the recent forecasts, '88 through '90, while they vary before and after, they all pretty much pass through the number 2,000 and the year 2000. Is that because that number is a target, or is that just a coincidence, in terms of offsetting GDP and programs or what have you?

A. I think the process of deriving the forecast, the primary load forecast, involves an assessment of the feasibility of the target. And the target was set at 2,000 megawatts, and as time has gone by, we have not -- we have been comfortable that we could meet that target, but we haven't felt -- and one of the reasons we have been comfortable that we could meet the target is that there seemed to be a corporate commitment to meeting the target; that is, one way or another, resources would be brought to bear to achieve that result, and that made it a good forecast. Essentially, those circumstances have persisted.

Q. So I guess you are confirming it's a target, and you are comfortable with it because you feel the corporation has chosen it and chosen it with some commitment?

A. Yes. It's a feasible target, it

remains feasible. We look at it each year on the sort of feasibility of it. And there is a lot of uncertainty, clearly, about how successful demand management programs are going to be: They could produce results that are higher or lower than what we are envisaging at this point. And given that, we are expecting that the corporation will devote the resources required to at least achieve the 2,000 megawatt result.

Q. I noticed in Exhibit 1.7.65, which is included in the package -- I will let you turn that up. You noted in that answer that --

THE CHAIRMAN: Just a moment, please.

MR. D. POCH: Yes.

THE CHAIRMAN: Yes, I have it now.

MR. D. POCH: Q. Just as a preamble. We agreed earlier, I believe, did we not, that the longer term forecasts, that is, more than five or six years out for DSM, are set by your group as opposed to -- in collaboration, obviously, but as opposed to being set by the Energy Management Branch?

MR. BURKE: A. Well, I think I said it was a joint effort.

Q. All right. In this answer, 1.7.65, you note how the demand management forecasts are based

on system avoided costs, as produced by system planning. You made no explicit assumptions about financial incentives, but you go on to observe, for the two major programs you list at the bottom, that the incentive level is about 21 per cent of avoided cost.

Now, I understand those numbers have shifted a little because of changes in the way you calculate these things since you wrote this. But leaving that aside, if we picked as a corporate policy that you pay 100 per cent, would that change your number 2000 for 2000?

A. Well, I think you will find on page 76 of Exhibit 9 that we are expecting, in order to achieve the target, that in some areas, as required, incentives up to a hundred per cent of avoided costs will be paid as part of achieving the 2,000 megawatt target. But until we get a better sense of the market, we are not -- it isn't clear at this stage, in which segments we will be required to pay that amount in order to achieve the 2,000 megawatt target. But simply to say that if we raise incentives above the level that's indicated in this response, therefore, the 2,000 megawatt target should change, that would be incorrect.

The target is based on an assumption of significantly increased incentives being required,

starting in the, sort of, -- well, '92/93 is what we say in this document. And that period is chosen as the end of a kind of an initial research into the market sort of period and the beginning of a major ramp-up in demand management efforts.

Q. Let me understand then, are you saying that, even if Ontario Hydro --

MR. B. CAMPBELL: Just a minute. I'm sorry, Mr. Chairman, this is the kind of question that, when we get to Panel 4, we will be dealing with in some detail. It goes directly to the quantum of the demand management results, that we expect to make the difference between the basic and the primary focus. Mr. Burke will be back on that panel, but there is a lot more that goes into this than simply the forecasting side of the equation.

MR. D. POCH: That is fine, Mr. Chairman, I can accept that. We can leave that for Panel 4.

THE CHAIRMAN: Okay.

MR. D. POCH: Q. Panel, in picking the potential for conservation or non-utility generation, you have told us it relates to avoided cost, avoided costs would include in it a consideration of capital costs and the cost of capital, would it not?

MR. BURKE: A. Certainly, it's the

corporate estimate of avoided cost.

Q. And the cost of capital is a function of the interest rate, you are assuming, and the equity cost, if there is any of that capital?

MR. ROTHMAN: A. Yes.

Q. Are you familiar with the concept, social cost of capital?

A. I have, as would most economists, have some acquaintance with it. I'm not an expert in social costs.

...

[10:25 a.m.] Q. You don't forecast a social cost of capital or a social discount rate and provide it to system planning?

A. No.

Q. The discount rate used would, of course, I take it you'd agree, impact the weighing of different options, to the extent they have different capital profiles in time and amount?

A. Yes.

Q. And you are aware that there are other agencies, like the National Energy Board, that do use the social cost of capital in assessing the merits of different projects?

A. Yes, we are aware that there are Treasury Board rates that are used for the cost of capital. And...

Q. Well, Mr. Rothman, since you have said you are not an expert on it, and since you said you don't predict, I won't push you further on that then.

Just on the -- did you want to say something, Mr. Rothman?

A. There are some documents within our interrogatory responses, to some of which I've referred already, which address issues of the cost of capital.

And if we wanted to visit some cost of capital issues, we might do that with reference to those documents.

Q. You've just indicated to me you are not an expert on social costs of capital. Is one of your colleagues here an expert on social costs of capital?

A. None of my colleagues here.

Q. Thank you. Just looking at interest rates more narrowly then, interest rates as you forecast them in the economy, you mentioned that there was a change which you were able to quantify. I think it was roughly 1.2 or 1.5 per cent. Do you recall that, Mr. Rothman? This is a change between '88 and now in your forecast.

A. I am sorry, Mr. Poch.

Q. I was just revisiting -- you had mentioned that the rate that was being discussed with you, I believe it was by MEA, you noted how it has gone from 3.5 to 5.15, I think those were the numbers, between '88 and '90, your forecast, long-term interest rates.

A. Of real interest rates, right.

Q. Real interest rates.

You have added another 33 per cent or so. Are you in a position to tell us whether that would be

significant enough to affect this weighing of...

A. That discussion was of prime rates, and prime rates are not used in these calculations at all.

Q. Which rate is?

A. It is the long term -- it is the corporate financial discount rate is what gets used in these calculations, and that corporate financial discount rate depends on our forecast of long-term Ontario Hydro borrowing.

Q. Okay.

A. Let me just go back, just for a minute, Mr. Poch, on this issue of the social cost of capital.

Q. Mr. Rothman, I really...

THE CHAIRMAN: You have asked him about it, I think he's entitled to say what he wants to say.

MR. ROTHMAN: As I have said, I personally do not consider myself an expert. However, my division, individuals in my division, have published papers on this question.

MR. D. POCH: Q. Okay, thank you.

Well, Mr. Rothman, I'm hesitating here. I don't really want to get into a discussion about what your colleagues say. So I'm not trying to keep

anything off the record here, but I think we are both going to be a little uncomfortable in such a discussion.

Will one of your colleagues be coming forward in an upcoming panel that will be in a position to give Hydro's view of this, give opinion?

MR. B. CAMPBELL: I don't think at the moment there is anyone else other than Mr. Burke appearing on the later panels. There will be someone on Panel 3 speaking to the construction of the corporate financial discount rate which is used in that calculation, and the considerations that have gone into that. And perhaps that is the right place for this.

MR. D. POCH: Thank you.

Q. Mr. Rothman, in returning to this question of long-term interest rates, and you have just told us that the number used, at least that you deliver up to system planning for the avoided cost analysis, is the long-term corporate discount rate, which I take it is predominantly the corporation's estimate of what it is going to cost to borrow?

MR. ROTHMAN: A. We actually deliver it to, I think it is controller's division, which then computes the corporate financial discount rate and delivers that to system planning. We deliver the

forecast of Ontario Hydro borrowing.

Q. Is that rate rising or falling over the long run? Between now and 2015, is the rate higher or lower in 2015?

A. Well, our forecast is that real interest rates fall, generally, over the long run. They do so for reasons that I discussed earlier, primarily as inflation stabilizes and market expectations become accustomed to a more stable inflation environment, inflationary environment, than real discount, real interest rates can fall, because the premium that is built into them for the risk of unexpected inflation declines.

Q. Mr. Rothman, Ontario Hydro, I take it, borrows not just in Canada, they borrow around the world, at this point, through the Ontario government's prospectus?

A. Yes, Ontario Hydro borrows extensively throughout the world, though in recent years only in Canadian and U.S. dollars.

Q. Would the events in Europe and the Middle East tend to put pressure on capital generally, and tend to raise interest rates, in the midterm anyway?

A. Yes. If we look in Exhibit 15, for

example, which is the long-term economic outlook annual review, the cover memorandum, which is the first page of that exhibit, if you read the last paragraph, it suggests:

> "Real interest rates have been raised for the next five years reflecting a number of factors, including an increased interest in national demand for capital, resulting from economic liberalization in Eastern Europe."

So we have, as you suggest, understood that there is greater demand for capital that hadn't been anticipated earlier, and that real interest rates will rise.

Q. I take it at that time you didn't capture the situation in the Middle East, the rebuilding of Kuwait, in particular?

A. We didn't. I think it is in fact mentioned a little farther on in this document, but, at that time, we hadn't known how much rebuilding would be required in Kuwait, and so didn't talk much about it in this document.

Perhaps I'm recalling a later short-term updating, in which that is more explicitly mentioned.

Q. Mr. Rothman, the other recent event

of note is the Ontario budget. There is some discussion in the press about the triple-A credit rating coming under scrutiny. Ontario Hydro borrows using that triple-A credit rating, first of all?

A. Ontario Hydro borrows under a provincial guarantee, or sometimes the province borrows in its name for Ontario Hydro.

Q. Is it conceivable that the borrowing program of Ontario Hydro, coupled with the implications of the budget, increasing of the deficit, increasing the province's borrowing, could put pressure on the cost of capital, upward pressure?

A. It is conceivable that the borrowing programs of Ontario Hydro, together with those of the provincial government, and some reconsideration of the quality of provincial government, then, could raise the premium that Ontario Hydro pays over Government of Canada bonds, for bonds of Ontario, province of Ontario; Ontario Hydro pay over Government of Canada bonds of similar maturities.

Q. If we just look at borrowing on markets outside of Ontario, outside of Canada, international borrowing, what proportion of the province's borrowing is on behalf of Ontario Hydro?

A. Up until this year, it has been

virtually all of the province's borrowing. I don't know what the proportions have been in the last little while.

Q. We have already touched on the differences you've had with system planning about electricity prices. You also mentioned that there is, and I don't need to go into that, but you did mention with someone else that there is a forecast that you work up jointly, which is the cost escalator forecasts.

A. Yes.

MR. B. CAMPBELL: Excuse me, Mr. Poch. I don't recall any of these witnesses giving testimony, or anyone giving testimony, that this group assists in planning. I think there was some discretion as to comptrollers and such, but I don't believe it was system planning.

MR. D. POCH: Perhaps we can get a clarification.

MR. B. CAMPBELL: If this matters to you, I think we should clarify it right now.

MR. D. POCH: Sure, electricity costs...

THE CHAIRMAN: Cost escalators, is that right?

MR. B. CAMPBELL: No, this question started out with a statement about the disagreement

with system planning over the cost of electricity. If it matters what part of the organization Mr. Poch thinks this -- where these discussions have taken place, it has not been -- these witnesses may be clear that it was a different part of the organization, not system planning. I'm just concerned that if it matters to my friend, Mr. Chairman, we might as well clear it up right now.

MR. D. POCH: Let's clear that up then.

Q. In that discussion we had about your forecast for higher electricity prices, then, whatever that other official forecast was, whose other forecast was that?

MR. ROTHMAN: A. It is not an official forecast, in some cases, but it is produced by the financial planning and reporting division.

Q. All right.

A. I'm not sure that I would call it a disagreement, however.

Q. A different vision.

A. A different view. That is acceptable.

Q. Now with respect to cost escalators--

A. Yes.

Q. --that is a jointly developed

forecast, is it?

A. Because it is specific to Ontario Hydro to get the data that we would need for cost escalators, we need information from other divisions in Ontario Hydro.

As I explained, a cost escalator is a cost of a weighted basket of the goods and materials that go into specific Ontario Hydro activities. We don't have information directly on that. We have to get it from those sources in Ontario Hydro which do have information. So they give us that information, and we then develop the cost escalators from the information they give us.

It is also joint in the sense that, typically, we don't initiate new escalators. The need for a new escalator arises from a client division, and we would then work with them to define what escalator is needed and to get the information that we need to compute the escalator.

Q. And that information...

A. But...

Q. Sorry, go ahead.

A. But it is the information on what goes into the escalators, and the components of the basket come from another division. Information on the

escalation is entirely done within the economics and forecast division, using, as I have said, external sources of forecast information as well as our own.

Q. Just what goes in the basket comes from the particular division that is building or buying a particular project or endeavour?

A. Yes.

Q. You said you weren't able to go back and do an after-the-fact performance test of how well you'd done on cost escalators, because many things have changed. Is that fair?

A. Yes, fair enough. We actually haven't thought of it, so I can't be positive that we couldn't, in some way, do something, but I'm not sure how valuable the exercise would be.

MR. BURKE: A. Well, maybe I would want to correct my...

THE CHAIRMAN: Just clarify to me, what use do you make of cost escalators? What is the function of cost escalators?

MR. ROTHMAN: The cost escalators are used for planning future costs of almost any activity in Ontario Hydro. For example, there are cost escalators for operation of various kinds of plans. So that when budgets are being done, the cost escalators

are applied to some of those planned operation functions.

When there is a potential construction project being considered, or when something like this plan is being considered, the cost escalators are used to escalate the future cost of, for example, the operation of the plants that might be built under this plan.

So that costs of those plans are all escalated with the cost escalators into the future, and then discounted back to the present with a corporate financial discount rate. And Mr. Burke is going to go to add some information on how we monitored cost escalators in the past, because, as he reminds me, we have done some of them.

MR. BURKE: Well, no, actually, what I was going to say was that it is not that we hadn't thought of trying to do some sort of is after-the-fact checking. I think Mr. Rothman is right. There is almost no data base from which to check after the fact. That is, the baskets change all the time, and nobody is particularly keeping track of the expenditures on particular items, as they were, or would have been, five or ten years ago, so that we can now check to see whether what we said five or ten years ago is now

correct today.

Hydro is the only purchaser of some of these things, so it is not like we can look at a Statistics Canada report and see what the index has done for that particular combination of goods and services.

MR. D. POCH: Q. Could you not, say, take pressure tubes or some such component, look back at what the information you had at the time that you did a cost escalation, or whatever basket it is, the smallest basket that you have, and then see how you did in reality? I mean, we do have some history here now.

...

[10:45 a.m.] MR. BURKE: A. Well, the baskets aren't as precise as that. You know, we are talking nuclear construction costs or fossil construction costs, and to actually do that requires a lot of information which is not currently collected and analyzed by the company.

Q. Okay. And finally, on this question of the interaction between different parts of Ontario Hydro, I am concerned about something that I call the self-fulfilling prophesy. Mr. Rothman, we have spoken about this before, but let me elaborate what I mean and you tell me how you deal with this problem.

You make a load forecast, it underlies a planning exercise such as this one; system planning does what they think they can to optimize the capital construction program to get those arrows to line up between supply and demand. The world, of course, is never that perfect, it doesn't unfold according to your forecast. For the reasons you have stated, where the motivation of the corporation in the '80s when they were marketing load, there is a marketing and a rate structure effort that goes on to try to get load to soak up, if it's excess capacity, soak up excess capacity, because that's what gets the cheapest unit price in the short-term. That affects the rate of load growth and thus in turn affects your load forecast and

the cycle repeats itself. Is there any way to avoid that kind of self-perpetuating error?

MR. ROTHMAN: A. When we go through our forecast process, it's a problem that economists would call simultaneity here, that the price of electricity determines demand, and as you have suggested, there are various ways in which demand can determine price, if the price is cost-based, as it is in this case.

So one of the things that we have done with this loop problem, is once we have made our forecast, to go to system planning and say, what are the cost implications of this forecast, if any, and do they differ from the cost assumptions that underlay the price assumptions that are in this forecast.

And if we were to get information that said, this demand forecast is not consistent with the price forecast that underlies it, in effect, then we have to go through another iteration. We have done that a few times and haven't found a significant problem of inconsistency, that is, we haven't found that the demand forecast that results from an existing price forecast produced demand that caused prices either to the rise or to fall beyond what was a reasonable range of what had been in the original price forecast.

Q. That's interesting, Mr. Rothman. I am not sure if it helps me with the concern that I was raising, that is, the concern about when, for whatever reason, the world doesn't unfold as you forecast, and the corporation nevertheless tries to help the world along a little, because it perceives it's in the public interest to do so. That is, it markets or adjusts the rate structure to encourage people to use what capital facilities are in place, because those capital facilities were built for the previous load forecast, and that that is to some extent effective, however effective it may be, and that in turn affects future load forecasts. As a load forecasting problem, I am wondering how you deal with that?

MR. BURKE: A. Well, I guess my perception is that it is not clear to me that the marketing efforts affect the rate of load growth in future. They may affect the base from which the load forecast starts, in the sense that, by 1990, for instance, load may be higher because of the marketing efforts you are talking about, although, as I said before, I am not sure how much, I am not sure that that necessarily translates into a change in the growth rate in future.

A lot of the efforts that were done in

the mid-'80s were efforts designed to perhaps advance the installation of capital equipment that would have been installed by industry anyway, but perhaps at a later date. And certainly industry would not have been interested in making a financial commitment to some of these facilities on the basis of several -- just two or three years of perhaps an incentive rate.

In fact, I think it was because of that that we got a fairly good take-up of these rates. But effectively, it's fundamental long-term economics that affects most of these decisions, and probably the effect of, certainly, the programs in the mid-'80s was, if anything, just to advance decisions that otherwise would have been made. So I don't see that that affects the growth rate per se. It affects the starting level.

Q. Did you do a study, an analysis, of all the various efforts that the corporation has made, to see if your understanding is borne out, or this is an impression you have, given your perch inside the corporation?

A. It is my impression given the nature and the design of the programs that I am aware of; that is, they were not designed to, in some sense, do anything other than create -- to the extent that they would. I really don't have a good estimate to the

extent to which these programs were successful.

For one of your requests the other day, I will have some information later this morning on what was thought to be the results or the take-up of that incentive rate structure for industry.

Q. Mr. Burke, let me just ask you this then. If Hydro was successful in its marketing efforts and the growth rate in, say, the '80s, in electricity demand was higher than it would have been without that marketing, would that not affect the growth rate projection you would have made in an econometric model, for example?

A. Well, it might in an econometric model if there was a significant effect, but as we pointed out at the time, this forecast is essentially an end-use model and the marginal rates are not affected by what went on in the '80s.

Q. That's a point of debate between us but I hear your point. Doctor, you have already given us evidence on to what extent people change their appliances once they have them. So I have discussed the concern here.

A. That's my point exactly, it's the base that's changed, not the growth rate.

Q. All right.

A. And to some extent, the base may be simply an advancement of certain decisions that would have come later.

Q. Okay, let's move on then to the question of forecast reliability. Can we go to No. 26, in the package? Page 26 of Exhibit 107. This is a graphic, simply, of the forecast that Ontario Hydro has made for the year 2000. It's in megawatts, peak as opposed to energy, or average megawatts. And the axis along the bottom is the year that the forecast was made.

Just for the Panel's assistance and for the record, we have also included in our package Exhibit 1.6.42, which is an interrogatory posed by Northwatch, where they asked Ontario Hydro to chart the forecasts, and it is a series of graphs showing the changing pattern of the load forecast projection over time. It couldn't be reduced to one graph, because they were looking at all the results here, as opposed to what we have done here, we have just picked the year 2000 so we could squeeze it on one graph.

First of all, Mr. Burke, obviously, this shows us this period from the mid-'70s to the early '80s when there was quite a change in your forecasts of the future. Who was responsible for forecasting in

that era inside Ontario Hydro?

A. Well, I guess the manager of load forecasts until about 1982 was Mr. Larratt Higgins.

Q. And Mr. Higgins was the gentleman we saw advising the counsel for AMPCO the other day, I take it?

A. I guess, yes.

Q. And at the time it was an econometric forecast, a relatively simple econometric forecast, that was used inside the corporation? Mr. Rothman, do you recall?

MR. ROTHMAN: A. I wasn't in the corporation at that time.

MR. BURKE: A. I think that the forecast reports, prior to the mid-'70s, did not particularly give the specific methodology used, especially for the long-term forecast. For the short-term forecast, it was methodologically similar to what we do today, in the sense there was the customer forecast, and there were other simple models, but the methodology for the long-term forecast I am not so sure about.

Q. Mr. Rothman, when you came on the scene, when was that?

MR. ROTHMAN: A. 1982.

Q. The methodology for the long-term

forecast was an econometric methodology?

A. The long-term forecast referred to an econometric model. It also referred to an end-use model.

If you read the load forecast report, clearly it would say something like, the recommended forecast tends toward econometric run number, whatever.

There was no clear statement that the forecast itself was directly taken from econometric modelling.

Q. There was not the end-use forecasting capability within your organization at the time, anything near what we have now, I take it?

A. No.

Q. I guess it's obvious to point out that the drop here is dramatic, some 70,000 megawatts. That would be -- what is a Pickering reactor, 500 megawatts? 140 Pickering reactors' difference? Can we take our cue from that, in terms of forecast reliability?

MR. BURKE: A. I think we have made quite a few points about what happened in the mid-'70s and the measures that Hydro has taken to try not to repeat the sort of change, dramatic change, in forecasts that occurred then.

We hoped that by analyzing with our both multi-equation econometric and end-use models, that we will get to the sorts of compositional changes and the changes in the drivers at various detailed levels and have a much better sense, in future, of any of these sorts of changes that happened historically.

Clearly, every utility in North America experienced a transition from a history of 7 per cent growth, on average, to one of 3 per cent or so. We hope we have taken steps, the right steps, to improve our forecasts, and I wouldn't want to suggest that the way we do forecasting now is the way it was done 20 years ago.

Q. Mr. Burke, is it fair to say that there were some unforeseens that confronted the forecasters in the '70s?

...

[10:59 a.m.] A. There were certainly some unforeseens. But as I have pointed out, I think in cross-examination by the MEA, that some of those ones, by hindsight, seem to be less significant than they seemed at the time. That is, the oil price shocks that seem to have captured everyone's attention, by hindsight appear to have had an impact on the growth rate of GDP everywhere for several years, and caused a recession in the mid '70s, and probably reduced the long-term growth rate slightly, and studies are in the order of a tenth or two or three.

But then, of course, since then, the oil prices have come down. That was on the basis of maintaining the $40-type per barrel prices that we reached by the end of the '70s. And so that some of those obvious things, I think, are not as important by hindsight as they appeared at the time.

The sorts of structural shifts and demographic trends that we have been discussing today, which are much more gradual, are important. And certainly the price change in electricity itself in the late '70s seems to be important.

MR. ROTHMAN: A. I think, Mr. Poch, this chart that you have shown here on page 26 is an interesting one, if you are talking about forecast

reliability.

The overwhelming impression that one gets from this chart, of course, is that of a major change in the forecast between, say, 1974 and the early 1980s, and not much change since then.

If we wanted to take this same chart and plot it from 1981, say, on, and put it on an expanded scale, it would then look as if the forecast had been all over the place. But in this context, the forecast for the year 2000 looks relatively quite stable over roughly the last ten years.

MR. BURKE: A. By the way, Mr. Poch, that picture is included in the interrogatory response that you were referring to. Certainly, the famous NAERC fan is a function of the '72 to '81 period, which was plotted in interrogatory response 1.6.42, but by the time you get into the '80s, relative stability in the forecast has returned.

Even when we blow it up a little bit on the very last page of that interrogatory response, while there have been changes, the forecast has moved down and back up again. If stability is some indicator of reliability, which I'm not sure it is, we have had a fairly similar view of the fundamentals for the long term, for about ten years now.

Q. So your forecast hasn't been changing as radically, but, of course, you have agreed, I think, that that doesn't say anything about whether or not, come the year 2000, reality will perform any more predictably?

A. No, that is what our uncertainty methodology is about; we are trying to get a sense of the likely range around that forecast.

Q. Okay, let's take a look at that question then.

MR. ROTHMAN: A. While we are starting on that, what does give us some comfort, of course, is that the long-term forecast is now out of ten years ago are now coming closer into line with the actuals of today than they had been. If we go back to the 1970 actual and compared forecasting, or '71 forecasts, say, and compare it to the '81 actual, we'd find quite a large divergence. Whereas if we go back to the '81 forecast, and compare it to the '91 actual, we are quite a bit closer.

Q. All right. But even if we were to borrow methodology from Ontario Hydro, if we were to take all of the nine-year out forecasts that could be compared to reality - and you have conveniently provided those to us at page 106 of the '89, 12/11

forecast, which -- the exhibit number evades me, but we even included it at page 27 of our package - even if you took that column under the No. 9, which is expressed in per cent terms, if I understand it correctly, the per cent that your forecast nine years out differed from reality, and the numbers in the left-hand column are the years that that particular forecast was made.

I just, you know, added up the absolute value of those and divided by however many there are, and got an average error of about 18 per cent. And just attaching it to the year 2000, that is over 5,000 megawatts.

So even not putting any special weight on that big shift in the '70s, taking a look at how you forecasted from the '50s through '80s, a forecast we can look at in reality, there is quite a lot of uncertainty there, is there not? Quite a lot of unpredictability in the world?

MR. BURKE: A. I think the thing you have to do is decompose the periods. I think you have captured quite well the fact that the '70s was a period in which forecasting did not perform very well. And if you look at the period prior to about 1970 or '68 or some year like that, the areas are fairly modest, and

you really don't have too much experience of the error from 1980 on. Because if you are looking at nine- or ten-year ahead, that is pretty well it.

So there is a ten-year period in there, from about -- well, maybe it is eleven years, from about '68 through to '79, which has large -- you have chosen nine-year ahead forecast errors. And my sense is that that comes on a history of about 70 years of growth, that has averaged fairly steady growth historically. And the transition that occurred, for many reasons, in the '70s, is not one that I would think one could say is now inherently built into the system? That is, we are going to have transitions like this every few years. I don't think one can conclude that.

In fact, what I would conclude is major shifts like this are rare, and I am not sure I would want to base my long-term projection of uncertainty on this one period, which happens to have had a radical change in it.

MR. ROTHMAN: A. If you look, Mr. Poch, at this table, just to reinforce in a fairly simplistic kind of way what he was saying, if you look at the years before '68, you just don't see any high numbers in the tables. Just look across those rows and down

the column. Similarly, if you take -- that is, before '68 and the year the forecast was made.

Similarly, if you look at the forecast made in the year 1980 and those subsequently, not one of them has an error as large as the average you just suggested for the nine-year out forecast. The largest error that is there is about 12 per cent.

So as Mr. Burke has suggested, even looking at this history of past forecast accuracy, the '80s are beginning to look a great deal more forecastable in that sense, in your sense, than were the '70s.

Q. The long-term forecast you made in the '80s, we can't, of course, see how you will have fared, nine, ten, fifteen, twenty years out.

A. The forecast, as I suggested earlier, if we look at the ten-year forecasting, the ten-year forecast made in 1980, these data are a little old, because these are from the forecast '89, but anyway the ten-year forecast made in 1980 was out by half a percent ten years later. That is pretty close.

Q. As a forecaster, Mr. Rothman, you wouldn't bet the farm on your ability because, in one year, you got it close.

A. No, no, absolutely not. That is

luck. When you come within half a percent on a ten-year forecast, that is luck.

If you look, as you plan, you look at the history of that 1980 forecast, there were times when it was out by as much as 10, 12 per cent. So, absolutely, that is luck. The point is that if you look at that pattern of forecast error throughout that table, the pattern of the '80s is that those errors are smaller.

Q. You express your confidence in the forecast in terms of uncertainty bounds. This is the 80 per cent confidence limit we have heard spoken of. Just to recap, you actually make one forecast, and then those upper and lower 80 per cent confidence limits at the 10 and 90 per cent confidence marks, those aren't independent forecasts. They aren't forecasts at all, they are just perturbations of that one forecast that is the medium one?

MR. BURKE: A. No, I wouldn't describe them as perturbations. They are the 10 per cent and the 90 per cent points of the distribution about the load forecast, the probability distribution about the load forecast that we estimated.

Q. But it is one forecast, is what I'm saying.

A. It is a median forecast that is the

resolution of the econometric and end-use modelling process, and then the major driver effectively, and its uncertainty is translated into an uncertainty for load.

Q. Just so I have it clear, but there is just one load forecast.

A. Well, there is a median load forecast, yes. And a complete distribution around it.

Q. Fine. And the planning band we see throughout the application, the balance of power, that is derived from this 80 per cent confidence distribution around your median load forecast?

A. Well, the low case, or the low, sometimes called forecast in there, is the line through the 10 per cent points of each year's probability distribution. And the high is through the 90 per cent points. And that gives you an 80 per cent range, 80 per cent confidence band.

Q. And the band within the balance of power, you have just told us, conforms to these confidence limits. Those are the confidence limits obtained through the new methodology for calculating uncertainty that was introduced just before -- for purposes of the '88 forecast and for use in the balance of power?

A. The new methodology was introduced in

part because we had a fair round of criticism from external groups, like the select committee and the technical advisory panel and so on, that our bands previously were too wide, and we should re-examine our methodology. So we re-examined our methodology and took a different approach, and this is the one that we derived.

Q. First of all, in Exhibit 1.9.10, there is the quote:

"Uncertainty is a psychological state that stems from a lack of absolute sureness."

Do you subscribe to that definition? These things come back to haunt you, Mr. Burke.

A. That was certainly the perspective of the other author of that paper or the main author of that paper, Dr. King. That is certainly one way of looking at it.

Q. What I'm getting at, Mr. Burke, is that, in science where we talk about uncertainty, a common usage is uncertainty in measurement, the uncertainty created by the resolution of the measuring tool around, when you are measuring something that is a reality. But the uncertainty we are speaking about here isn't of that type, is it? You are not measuring

any -- the uncertainty isn't created by the lack of a resolution in any kind of measuring tool. You are not doing a measurement?

A. Well, yes, this is in a forecast period.

Q. Right.

A. This is our expected uncertainty in future.

Q. It is the confidence you place in the educated guess you have made?

A. Well, I think educated guess is a little unkind. We'd like to think of it as a very informed judgment, given all of the information that we really think is available at this point to work with for Ontario.

Q. Could I rephrase that then? Why don't I suggest that what we are really -- what we have here, as opposed to a statement of the resolution of measurement, we have an indication of your degree of doubt in the reliability of the central median load forecast.

A. Okay, does it make it clear, if I suggest this is a range forecast? In other words, it suggests that we assign 80 per cent, if you are choosing the 80 per cent band, confidence to the range

that is presented in the documents, rather than having people focus on a single line, the median itself.

Q. Okay.

MR. ROTHMAN: A. Mr. Poch, I just wanted to enforce that, because I'm not sure that you heard it. You had said the forecast is a forecast is a line, and it is not. The forecast is the median and a range; they are not separable.

Q. Mr. Rothman, all of these techniques we have heard about, the EEMO and the end use, they produce a number, and then you use judgment to pick which one you are going to use, or which one in between. Have I heard that right, first of all?

MR. BURKE: A. To estimate the median value of a complete distribution, yes.

Q. And this bandwidth, this range that we are speaking of, isn't produced using that technique at all.

A. No, but we have made it quite clear that you couldn't use those models to produce an uncertainty band, but this is, in our view, the best equivalent to that. They are using a simplified model to proxy the effect of simulating these big models, and we went into that in direct evidence that, in fact, to try to simulate the big models is an almost impossible

computational task.

Q. Let me start then. We will get into this in some detail. Let me start by asking you to explain what the old method was previous to the DSP.

MR. ROTHMAN: A. Well, previous to 1988.

Q. Previous to 1988.

MR. BURKE: A. The old method was to look at the forecast errors that were observed, from about 1959 onwards, and estimate the standard error of forecast errors that had occurred in the one-year to ten-year ahead forecasts. And the period that we had these one- to ten-year forecast errors for, of course, includes the period that you have just been looking at in that chart. In order to derive the standard error for forecast years in excess of ten years into the future, the approach was then to use a regression equation on the standard errors that were observed for the 1- to 10-year ahead period, and extrapolate those out to 25 years, if that was as far into the future as you wanted to have a confidence band for.

And having, as you observed, extremely high forecast errors for a decade in there, the effect was that we got very wide confidence bands. Especially if all we did was to linearly extrapolate those errors 10 years out to 25 years.

Q. When you did that, you didn't just pick those, the experience of the '70s, you averaged your forecasting experience, with whatever data was available.

A. But that is the point. The data, if you look at those charts in 1.6.42, we did not prepare forecasts longer than about ten years into the future, before the late '50s and early '60s. So if you're asking, what was our experience with forecast errors, the experience with forecast errors refers to forecasts made in the late '50s, early '60s, for the late '60s, early '70s. That is the first ten-year ahead forecast error experience we had.

Then, by the time you get to the mid '80s or so, when you are using this technique, you might have had 15 or 20 ten-year ahead forecasts to work with, of which 10 or 12 would have to fall bang in the middle of of the 1970s.

...

[11:20 a.m.] Q. So the old technique looked at how good or bad your forecast had been compared reality as it unfolded?

A. That is correct.

Q. We are going to move on to the new technique.

Mr. Chairman, this would be a convenient place to break, if you would like.

THE CHAIRMAN: All right. We will take the morning break, 15 minutes.

---Recess at 11:21 a.m.

---On resuming at at 11:37 a.m.

---Off the record.

THE CHAIRMAN: Mr. Poch?

MR. D. POCH: Q. I wanted to turn to the distinctions between the old and new method of the uncertainty analysis. Could you turn up page 28 of Exhibit 107? Now, let me explain this to you so we are using the same language.

What we have done here is put three different things on the same graph. For each load forecast for which there is the date mark, you use on the bottom axis, the '86, '87 and so on, to '90, we have plotted 80 per cent confidence limits as the top and the bottom of the vertical lines.

The prong, if you will, of each of those vertical lines projecting to the right, in the middle, is the medium load forecast for the year 2005, made in that particular forecast. And the line that either projects off to the left, or floats below those ranges, is the actual level of load in the year that the forecast was made. So, the first one would be what the load was on the system '86, the last one would be what the load is on the system by 1990, and you can see it's risen somewhat.

Now, Mr. Burke, first of all, pre-'88 you didn't actually do 80 per cent confidence limits, you did 60 per cent confidence limits; is that correct?

MR. BURKE: A. We published 60 per cent confidence limits, but effectively, the information was there for anybody to calculate whatever level of confidence they wished.

Q. If you assume a standard distribution, if you know one pair you can generate other pairs?

A. In the methodology prior to '88, we did assume a normal distribution.

MR. ROTHMAN: A. There weren't always strictly 60 per cent confidence limits in the period before 1983.

Q. All right. We generated 80 per cent just to be consistent with your current practice of publishing these as 80 per cent.

Mr. Burke, I know you have looked at our calculations, I know there are some concerns with the second or third significant digit, but would you agree that the presentation we have here is in the ballpark?

MR. BURKE: A. It's in the ballpark, but the calculations you have made are sort of incorrect for each and every sort of value, but the ratios turn out to be okay, so...

Q. That's because just the number used to transform from 60 to 80 was read off a stat graph wrong, I take it you have surmised.

A. Yes. And I on couldn't say exactly how much -- we haven't recalcuated what the bands would be, but I think the way this sort of thing goes, the ratios of these numbers would end up to be similar enough to get the general idea, that the bands were wider before than they are now.

Q. And in fact, the 80 per cent confident limit, back in those years, got you even below the load in the forecast year, the year the forecast was generated?

A. Yes, it certainly had negative

growth, I guess those were about 20 years out. That was part of the problem we had with the bands, that we didn't believe that it was reasonable to have sustained negative load growth in Ontario.

Q. All right. So there are two changes that are apparent to me, if you could confirm, between the old methodology and the methodology you have adopted in '88 and has been used in the balance of power.

First, the apparent certainty or uncertainty or reliability, whatever term you are comfortable with, of the load forecast has narrowed significantly. And second, the possibility of load actually dropping from the year of the forecast is now beyond the pale, if you will?

A. Well, I haven't calculated what the confidence level would be. Obviously, it's not zero probability, but it's quite low. You have to recall, this is for the basic load forecast.

Q. Yes, I understand, but all of these were for the basic load forecast.

A. That's true.

Q. We started off our discussion today on this topic, with this quote about uncertainty being something in the mind of the forecaster. Wouldn't the

old method have the strength, that it is a reflection of the actual degree of accuracy of the forecast, as it was actually achieved in past forecasts, compared to reality; it is objective?

A. Well, I think the concerns we had with the old methodology are outlined on page 2 of Exhibit 10, and I have reviewed some of them already with you, but there are many concerns.

We discussed the issue with the sample period for which we had long-term forecast errors and the fact that the forecast errors we had were not 25-year forecast errors at all; the longest we really had any reasonable sample to work with was about 10 years. But there are other, sort of, conceptual problems, I think, with using the approach that we used to use, and that is, to take as a hypothetical, supposing we had actually forecasted extremely well historically. Supposing, instead of using exponential growth, we had used linear growth, and by some amazing feat of forecasting, gotten the growth rates from '64 to '85 or '90 pretty well bang on. I think you would agree with me that that would not allow you to infer that there was almost no uncertainty about the future, just because we happened to have chosen a forecasting methodology that worked out well. And that is the

problem with looking at forecast errors, you are looking at two things: You are looking how the actuals worked, and you are looking at how the forecast methodology that was used at some point in the past worked.

And, of course, the forecast methodology evolves every year, in ways that are -- In terms of what the impact on a 25-year ahead forecast is, it is almost impossible to say. But certainly, the methodology, I don't think, is something that determines future uncertainty in load.

How we particularly set about doing our forecast does not determine whether load is uncertain or not in future.

Q. So your method has changed, but, of course, the predicability of the future hasn't changed, that's your point?

A. Yes. We are not capturing this better than we did before, it is my view.

Q. Mr. Burke, you have said that and you have struck a parallel for a discussion between if you had fortuitously forecast right on the ball, that would, by the old method, generate a narrower set of bandwidths.

If we are forecasting something where

there is a very, very long history of stability, we might be reasonable to assume that, might we not, that if there was quite a stable pattern for many, many years, despite volatility in other factors in the economy, and your forecasting was accurate, then it wouldn't be unreasonable, would it, to grant you that confidence?

A. Well, both things perhaps go together, that if really the load growth had been stable, and it was a relatively straightforward exercise to forecast it, then, yes, they follow. But clearly, that's not been the experience for this one decade.

Q. So the broader band of the old technique is a reflection of the fact that you weren't able to assume such stability. You have told us about the various factors that led to the shift in the '70s.

A. The broader bands of the past reflect the fact that we made large forecast errors in the '70s. I'm not sure that that says we would make the same forecast errors again. I am not sure that that says that the same situation that arose in the '70s would happen again, or that the likelihood of it is adequately reflected by the fact that we have a sample of forecast errors that is almost totally dominated by

the '70s. We don't have a large sample of forecast errors.

If we had 70 years of 25-year ahead forecast errors to work with, I might be more inclined to use that approach, but we have a very small sample from a period which is historically unusual. And it is not the 25-year ahead forecast errors; it is only 10.

And I think one of the lessons we learned with our approach is that forecast errors of 10 years, actually, they don't differ nearly as much -- well, I guess, this is 15 or 20, looking at the numbers here. But in the short-term, the bandwidths are not nearly as different as they turn out to be in the long run, where we find that there are, as we have said before, self-correcting, I guess is the word we are used, forces in the economy which tend to drive the economy and load back toward some sort of potential growth rate for the economy, and when you take into account the trends in intensity, the trend for load growth as well.

Q. But Mr. Burke, if you went with this new technique, all these new techniques you have, and you went back to the pre mid-70s, you wouldn't have been tremendously more accurate than you were at the time. Those are unforeseeable shifts, were they not?

A. I don't know how we can speculate on

what was or was not unforeseeable. When you look at hindsight of what actually happened and you have discussed the changes in structural trends and so on with Dr. Dr. Buja-Bijunas, there was, obviously, a lot going on. To the extent that we can capture that now, whereas we weren't particularly looking at it before, who knows?

I think it is very difficult to speculate on what we could have forecasted 20 years ago.

Q. Would your forecast of the difference from a reality to your forecast back then have fallen within the bandwidths of your new technique, if it had been applied back then?

A. As a matter of fact, there is an interrogatory response that addressed that question, and we got it out once before. I could get it out again. I forget the number, but we put it on the record already. And it did look at the extent to which the bands that we would have gotten in '76 captured the actuals subsequently. And what we found, and as I stated at the time, was, in fact, the forecast made at the time, if we used our approach of taking, as the median forecast, the forecast made at the time which was for 7 per cent growth continuing from '76 on, then the bands we estimate, using the methodology we now

use, would not have captured it. But using the results of the equation, the single equation itself, that we now use, which is not what we do to forecast, just to be clear, it's the result of all this other stuff that we have talked about, but nonetheless it tracks what these models are suggesting right now, that that produced a forecast from '76 of about 5 per cent. And the 5 per cent median, the 80 per cent band did capture the results of the '80s.

That gave me some confidence that were we to do this exercise again, even using a single equation model, we would have come a lot closer. Perhaps if we had had all this information we now have, we might have been able to get closer still.

Q. Mr. Burke, the equation you have just gone back and tested retrospectively is one you developed with the hindsight of having come through that period. So is it surprising to you that it would be more accurate than what you did at the time? It is based on a regression of that very history.

A. Well, in simulating this, we did simulate up to '76. Like we didn't use an equation that was estimated to '89 in order to check this methodology. We did a simulation up to '76 with that equation.

The only thing you might say is, would we have, in 1976, tried an equation like that, were we aware that there were trends over the long-term in intensity. But that's my very point. Now we are aware of these things. Whether we would have or not, we can only speculate, but we are today, and we look at them in much more detail, in fact, than that single equation ever gets to.

Q. Mr. Burke, are you suggesting that the change in the bandwidth was driven by a change -- it wasn't driven -- let me put this this way: It wasn't driven by a change in the forecasting methodology per se, that is your load forecast methodology; it was an independent change?

A. Yes. It was driven by a change in the methodology we used to estimate uncertainty itself, and a critique of the old method, a re-examination of, what are we really trying to do here? Are we trying to see how accurate our forecasts were or are we trying to understand how uncertain load growth is, independent of who is forecasting it and how they forecast it.

Q. Let's look at the new methodology. Can you turn up Exhibit 10, please? Exhibit 10 is entitled "Uncertainty in the Load Forecasts, Summary of Results Developed in 1988 and 1989."

A. I have got it.

Q. Now, just to be clear. I understand that the method employed in 1980 is the stochastic simulation procedure and is a slightly modified method of the method developed in '88 and modified in '89 about which this document speaks; correct?

A. That is correct, yes.

Q. But the thrust of the procedure is the same, and let me go through my understanding with you, if I may, and get your acknowledgement that I have got it right.

You have got two relatively simple equations, one which predicts electricity demand given GDP, and I assume you mean gross provincial product there?

A. Yes.

Q. And another which predicts that same GDP, given population?

A. Yes. And power terms of both of those.

Q. Yes. And I will leave the discussion of power terms to Dr. Chapman and IPPSO.

This so-called uncertainty in the electricity prediction can be calculated if we know the uncertainty in the GDP prediction, and which can be

calculated if we know the so-called uncertainty in the population predictions, how the method works?

A. The way that this method is applied, the GDP bands, as I explained in direct, and as I have explained here, the GDP band themselves are mechanistically calculated using that equation, but they are checked against a survey of expectations of the range, the 80 per cent judgmental range for GDP to the year 2000 and 2010 that the members of the external economic forecast advisory committee have for Ontario.

Q. That's the fifteen advisers you have spoken of?

A. Yes.

Q. Go ahead.

...

[11:57 a.m.] A. And the intent, really, is that it is very difficult judgmentally to produce numbers for the seven-year ahead GDP range, the eight-year ahead, the nine-year ahead, the seventeen-year ahead, but people do have the ability to express their judgments in broad terms for periods like to the year 2000, to the year 2010. And so those judgments are benchmarks, against which the performance of this single equation is assessed. And then it is used to essentially produce the sort of detailed results we require for the intervening years, and...

Q. I only know one of those fifteen. That is Dr. Robinson. He's a member of that committee?

A. Not of the external economic forecast. He's a member of the Load Forecast Advisory Committee.

Q. Thank you. Could you provide us with a list of who those external advisors are, and what their backgrounds, affiliations are?

MR. ROTHMAN: A. The membership changes from year to year, dependinging on who is available and who comes and who came last year or didn't, and how valuable we found their input. So I can give you a representative year, if you like, say 1990.

Q. By that last comment, I take it, if

you don't find their input particularly valuable, you won't invite them back? You will try to find someone who can be more helpful?

A. What I mean is whether they say anything. I don't mean that we try to pick through those who say things that are flattering to us. But we have had people come in and just didn't say anything. But if they come and talk, we invite them back.

Q. These are economists from the economics forecasting community?

A. Yes.

Q. Places like Econometrics or rather--

A. Infometrica.

Q. --Infometrica?

A. Yes, DRI, banks, the financial community, and some private companies; the gas company, gas companies.

Q. They generally forecast using, I'm sure, a range of methodologies. But in keeping with the approach you have taken for GDP, they look at these broad econometric relationships, and indications of shifts of note in the economy, that sort of approach?

A. Yes. Some of them employ econometric models and some don't.

Q. Okay. Now let's take a look at page

22 of this exhibit. And that is table 7.1.

If I understand this correctly, you have taken all the historical data about population growth that you have available, that you consider reliable, and you have grouped it. So all of the one-year periods, there would be, I guess, if there are 27 years, there would be 27 one-year growth rates?

MR. BURKE: A. No, the data is from 1927 to '88. So it is 61 years. So it is sixty, one-year...

Q. Sixty one-year growth rates?

A. Yes.

Q. Then you have averaged those to get the historical mean compound, one year?

A. That is correct.

Q. And you have, say, taken all the ten-year ones that you could find, the first ten-year period, and then you have gone ahead a year and taken the ten-year period that started with that as a base year and so on?

A. That is correct.

Q. Added all those up and divided by, I guess it would be, 50-odd for that?

A. Yes.

Q. And that is the mean of the annual

growth rate for population in Ontario? It has nothing to do with predictions of population growth rate?

A. It is the observed history.

Q. It is the observed. It is the real history.

And the third column is headed "Historical Annual Deviation." That is a measure of, if we took, let's say, the batch of ten-year growth rates you were able to extract, and plotted them on a graph around the mean for the ten-year growth rates, you'd get a scatter of dots, and we could talk about the shape of how wide that distribution is, or how tightly clumped they are around that mean, by use of the technique of standard deviation, the measure of standard deviation, is that fair?

A. Yes.

Q. And the forth column -- and that is all real, still?

A. Yes, that is history.

Q. And it is a measure of the real variation around the mean, if you will.

And then the fourth column is simply the ratio of column 3 to column 2? So that sort of gives us a sense of how flat or peaky that spread of results was around its mean?

A. That is correct.

Q. Again, it is a real -- it is generated from real data?

A. That is correct.

Q. And just so we understand that column then, the higher that column 4 number, the historical standard deviation divided by the mean is, the more spread out the data is around that mean, more variation relative,--

A. That is right, yes.

Q. --in relative terms to the mean?

All right, I'm just trying to work through this step by step, so we find a point when we leave the real data and we get to the manufactured numbers.

And I guess that is column 5, is it not? That is where you put in place your forecast of future population growth rates for the one-year out, two-year out and so on, is that right?

A. Yes, that is correct.

Q. So it is - I know you don't like the term - your official educated guess, if you will.

A. I don't like the term. Anyway, it is our forecast.

Q. And in general, with perhaps the

exception of the first couple of years, the rate you are projecting, 10-years out, 20-years out, 25-year out and so on, falls beyond the reach of the standard deviation around the historical mean observed. Is that right?

A. That is correct. If you were to take, say, the 25-year ahead growth rates for population and plot them, rather than look at the scatter diagram of them, you would find that for the last 20 or 30 years that growth rate has been steadily declining. And it is not unreasonable at all to project that that will continue to decline.

So that as far as the demographic projection is concerned, certainly no concern that I have that just because when you look historically at the last sixty years, the average growth rate for population has fallen in the two per cent range, we have been forecasting something less than one percent, that is not something that is inconsistent with a wide sweep of historical data.

Q. All right. If we look at the sixth column headed "Adjusted Forecast Standard Deviation," let me see if I understand. This is essentially an imaginary, if you will, standard deviation, assuming it is centered on your guess of population growth for that

period, and computed on the assumption that this imaginary standard deviation will have some relationship to the -- will have the same relationship, rather, to your guessed population growth, as the actual standard deviation we saw back in column 3 has to the mean of historical rates.

A. Yes, that is correct. And I can explain, if you want, why we have chosen to do that.

Q. Well, go ahead.

A. Fine. As we indicated on page 10, I guess, at the bottom of the page, in item No. 3 in brackets, we said:

> "The confidence shown in the population forecasts is one of the judgmental elements in determining the uncertainty band for the load forecast."

Essentially the judgment for GDP -- sorry, that is made in scaling of historical standard error for population by the forecasted growth rate, as opposed to leaving it intact as it was before, is based on two levels of judgments. One level of judgment is about what the GDP band itself should look like, and the second level of judgment is about what we think the uncertainty in population really is down the road. And for the first part, the uncertainty, this scaling has

the effect, the desired effect, you might say, of producing a GDP band that we are comfortable with.

Q. Let me just, if I may, just interrupt you to make sure that I understand.

When you say scaling...

A. Yes, essentially...

Q. In other words, the ratio between -- instead of taking a standard deviation around the historically observed population mean, standard deviation of the actual population and performance, you have shrunk it in proportion to how much your forecast mean is compared to the historical mean.

A. I think that is an accurate way to describe it. Essentially, the 80 per cent band would be 1.3 standard errors from the median. And if we have a two per cent growth rate for population historically, versus a one percent in future, we are suggesting that the uncertainty in the forecast for population is not really as if it was 1.3 standard errors about the 2 per cent rate, but it is more 1.3 standards errors scaled down to what it would be at the 1 per cent rate. So can I just continue with my two-part answer?

Q. Sure.

A. The first part essentially was that this scaling has the desired effect. That is, it is

something which translates the standard error for population into a result for GDP that is acceptable, as judged by looking at the sort of confidence our panel of experts has in long-term GDP for Ontario.

The second layer of analysis and judgment really went into, well, how reasonable is it to have an uncertainty about population? Well, how would you come to grips with judgmentally an uncertainty for population in future, or, really, GDP in future. And the uncertainty for -- population is included in the equation for GDP, because it really is something that is available to us, readily, but as we noted on page 27, I believe it is, in the second paragraph:

> "Population uncertainty could be decomposed to look more closely at the components of growth, particularly immigration. The focus could switch to labour force growth with its known and uncertain elements."

I think if you look at most models of long-term growth, it is not population growth per se that people put into those equations, it is labour force growth. And labour force growth itself to be decomposed into labour force growth from sort of the indigenous population, the people that are here now,

and the labour force growth associated with immigrants into Ontario, either interprovincially or internationally.

And the thing about the labour force growth from people that are here today is, we have a very high degree of confidence about who is going to be here 15 to 20 years from now, because they are alive and kicking, and we have pretty good estimates of mortality rates. There is almost no uncertainty about how many people will be entering the labour force from people who are alive in Ontario today, 15 to 20 years from now.

What is uncertain is what will the immigration into Ontario be, 15 or 20 years from now? And that, when you look at it, what we're essentially saying is we have a forecast of immigration, and if you apply the standard error that we have got here, we are suggesting that the deviation --

That is, if all of the uncertainty in the future labour force in Ontario, which is an equivalent driver for GDP growth, or maybe even a better driver for GDP growth than population as such, was to come from the immigration side of it, the magnitudes we have are reasonable. And let me explain that.

Q. Well, Mr. Burke, if you don't mind, I think I've got your point, that obviously there is much more uncertainty in the immigration side of labour force than on the natural growth.

A. In a nutshell, let me say that, effectively, what this works out to is that the 80 per cent level we are suggesting that immigration, say 20 years from now, would be of the order of 100,000, plus or minus 40 or 50,000 people. And that at the 80 per cent level, our economic forecasters are happy with that. So judgmentally, we felt that this was an appropriate thing to do.

I would just like to make one more point to bound this discussion. If you look historically at GDP growth alone, that is, you look at what the 25th-year average, the growth, the standard error on the growth rate for GDP is historically, you actually get a narrower bound than what we are deriving through this approach.

So that, there are many ways to skin this cat; we have chosen one that is judgmental to a certain degree, but is a mechanism which provides us the annual information we require in what we believe is a relatively sound way.

Q. All right. And if you look at the

dramatic changes we witnessed in the '70s, you have already told us what you believe now in hindsight generated those changes in electricity consumption, and it was neither simply change in population, nor simply change in GDP growth rates. It was a number of -- it was compounding factors. There were all these factors you talked about: efficiency and productivity and structural shifts and so on.

A. Well, just a minute here.

Q. Isn't that fair?

A. One of the major changes was the rapid reduction in labour force growth rates, I guess, as you left the '70s. And the changes associated with compositional shifts and efficiency and all that sort of thing are captured by the relationship between GDP and load, which is captured by the declining elasticity that that single equation has and our forecast has for that relationship.

That is, we expect, as time goes on, based on the past trends, to see a declining relationship in the elasticity. That is, we are going to move from roughly 1 to 1, to maybe .85 in 2010.

Q. I hear you.

A. For that reason, the given change in GDP translates to a narrower, an 85 per cent, roughly,

change in load. But there are these other factors, the uncertainty in whether those coefficients are correct.

Q. All of those kinds of uncertainties about how you are modelling the economy, and as you readily admitted, no one was able to model accurately in the past, pre '75 or so. We wouldn't expect those uncertainties to be captured in the uncertainty population.

A. No, they are captured in the other parts of uncertainty that are taken into account in the remainder of the procedure. That is, we have got something for population here that generates a GDP band, or the GDP band is arrived at by a number a ways. But anyway, there we are with the GDP band. And then, we simulate the equation, its coefficients, and its residual standard error to get the total uncertainty in load. And it is the residual standard error and the coefficient uncertainty that reflects the changes and the uncertainty associated with the changes in the relationship between GDP and load.

Q. How do you set the uncertainty in that formula? How do you...

A. How do we set it?

...

[12:26 p.m.] Q. How do you know how certain or uncertain those relationships are?

A. Well, that's exactly what we use the statistical analysis of load versus GDP in that equation to achieve. It is, in fact, the standard error of the coefficients and the standard error of the residuals, as generated statistically by that equation, that when you estimated, ordinarily squares -- package essentially kicks out a standard error for each of these things. And what it suggests is that the trends have been fairly steady and predictable for the change, this is sort of the long-term change in the rate of efficiency improvement, if you want to put it that way, or intensity improvement is a better way, in the economy. And for the basic load forecast, that seems to be an appropriate thing to do.

We then, of course, increase the rate at which intensity declines by the demand management programs, but for the basic load forecast, that is well captured by history. And, you know, you might have expected more uncertainty about that, but, in fact, there has been a long-term trend torward declining elasticity values, declining ratios, between load growth and GDP growth. Just as they used to be over one, now they have declined to one and now we are

suggesting they fall below one in future, but that trend has been there for a long time.

Q. Mr. Burke, I want to keep on with this, this underlying driver of the uncertainty, the population uncertainty.

A. Well, I think you should probably switch to the GDP, because what I am suggesting is --

Q. Let me finish this, Mr. Burke. I heard you.

What would happen if you were predicting now population growth of closer to zero? That would narrow your confidence limits significantly?

A. I wouldn't use that methodology.

Q. Right.

A. This works for this data, to scale, to get the results that suit the GDP confidence bands we have. But clearly, if you had zero growth in population, this is not something that generalizes, nor would we think it should generalize. It just works for now.

Q. So you pick your scaling factor, because it gave you something which corresponded to the kind of uncertainty you generate with respect to the other concerns that make up your GDP equation?

A. Well, no. As I said, there are two

sort of tests that we apply. One was the GDP uncertainty suggested by our panel of experts on long-term forecasting, or forecasting the economy of Ontario, let's put the it that way. And the other is a reasonableness test on what is likely to actually generate uncertainty about the population forecast, and we concluded that, likely, it's immigration. And at the 80 per cent level, we felt comfortable with the implicit boundaries that we were putting on population. It may be, you could get another result for immigration, but I guess what we are saying judgmentally is that the 80 per cent level, we are not expecting together much more than 100,000 plus or minus 40- or 50,000.

Q. There is another assumption buried in here, as well, isn't there, that is that the uncertainty in this imaginary standard deviation around your forecast is equally distributed; that is, you have taken the historical variation in population growth rates around the mean for historical population growth rates, and you have assumed, in essence, that you are forecasting the mean and you will be right about that. That is, that the distribution is even on other side. You could be forecasting somewhere in the tail; couldn't you?

A. Well, I am not quite sure. I followed you up to the very last sentence.

Essentially, what we are saying is, yes, the only statistical assumption that is made in this process is to assume that these historical standard errors are normally distributed and that they are symetric. However, by the time you get to the GDP band it's no longer symetric because the translation process does not map one to one.

Q. You have made an assumption about the historical distribution, that is, that it is normal and symetrical around the mean?

A. Yes. If you look at the --

Q. And then you have over --

MR. B. CAMPBELL: I'm sorry. Could he finish his answer, please?

THE CHAIRMAN: Just one moment. I think they are both are at fault.

Please wait until Mr. Poch has finished his question. When he starts an answer, you wait until he is finished.

MR. D. POCH: So let me finish my question. I will go first. I will take that prerogative, if I may, Mr. Chairman.

Q. You have made that assumption about

the historical data, that is, that it is normally distributed and symetrical about the mean. And you have scaled that standard deviation and you have--

MR. BURKE: A. You have put this --

Q. Let me finish and then you can correct me.

--to create confidence bands around your forward-looking projection, you have assumed that it saddles on either side of your forward-looking projection and your forward-looking projection goes up the middle?

A. Yes, I think that's fair.

Q. All right. So if you are wrong about your projection, you will have been wrong about where the uncertainty bands should go?

A. That's right, and I will be wrong about my GDP band, but according to the experts, I am not.

Q. Right.

A. So that is my test. I end up in the range that the experts say I should end up in, and that's really the bottom line for me.

Q. Why did you go through all this, if you are content just to say they say I am in the range?

A. Because I need a process which will

generate this annually, which, you know, no panel of experts is going to be prepared to sit through. I need a process which can answer "what if" questions: What if we are five years from now and we want to know what the uncertainty is; from five years from now to some period in the future for GDP, which was a question that I was being asked by system planners. And you can't find a panel of people who are prepared to sit down and tell you the answer to that question.

I needed something that worked, that replicated judgments that other people make about long-term GDP uncertainty, and this does it. And if doesn't do it, if we end up in some world which doesn't make some sense anymore, we will do something different.

Now, when we move from GDP to load, that's a different issue. I have much more confidence in that mechanism. But if you look at any methodology that anybody has ever tried to develop to get ahold of uncertainty in load, eventually you are trying to get GDP uncertainty, judgment calls are required. Most people don't try to do anything like this.

As I say, for me, this was a check, and doing it this way produces results that are judgmentally validated, you might say.

Q. Apart from validating the direction of your forecast and these bounds with this external group of fifteen, this methodology that we have been speaking about in Exhibit 10, it doesn't at all test the historic accuracy of people's population forecasts, does it?

A. Well, you know, the world hasn't been populated by forecasters forever, and there isn't really a whole lot of history on long-term population forecast.

Q. I am not criticizing, I am just trying to understand.

This doesn't give you confidence ranges generated by the accuracy or inaccuracy of past forecasts. This just gives you a sense, if I may, of how much population growth rates historically in the period you have dealt with have deviated from the mean?

A. Yes, it is a sense of the variability of population and that is what we are really trying to say about load as well. We are trying to give a sense of the variability of load. We are not trying to, as we discussed earlier, get a sense of, if I used this methodology or that methodology 20 years ago, would I have done something better or worse and gotten different standard errors. We are not into that world.

We are trying to get a sense of, okay, I have got a forecast for load, how uncertain is it, intrinsically, and what elements of it are uncertain. And we have isolated what elements are uncertain and we have tried to then quantify them as best we can.

Q. So what you have done is taken this population fluctuation, if you will, done an adjustment to it, used it to drive an equation that produces a GDP--

A. Uncertainty.

Q. --uncertainty. And --

A. But the equation itself, of course, is estimated independent of all of this. The uncertainty is just something that is put into the equation.

Q. Yes. And you have set this, in effect, to conform to the kind of uncertainty that these fifteen economists express they have?

A. It was a good reasonableness test.

Q. All right. And now you are confident that you can take this and use it to project uncertainty around forecasts you will make in other years, and you have done so?

A. Each year we re-examine the methodology to see if it's appropriate, and we have

made changes to it every year since we introduced it, and I wouldn't rule out we will make changes to it in future. We have also identified, ourselves, things we would like to do that we haven't done yet.

Q. The scaling that you have done that narrows the standard deviation number from the historical standard deviation around the mean to the one you are projecting as uncertainty, that scaling is directly proportionate, at least in the range you are talking about here, to the difference between the historical mean and your projection for the future?

A. That is correct.

Q. So if you have a lower projection, generally speaking, if you have a lower projection for the future, that technique would get you a tighter set of confidence limits, and you have a higher projection, you would get a broader set of confidence?

A. But as I said, I wouldn't just mechanistically do this sort of scaling. If it gets me into a range which is unreasonable by some other tests, we will have to do something different, or we may have to abandon -- well, I don't think we will abandon this sort of approach, because we do need the detail it provides, but, you know, I think to expect that we are going to get sort of extended into a ridiculous

situations is just missing the point of what a pragmatic forecaster tries to do.

Q. So the test of reasonableness is whether its conforms to the range that economists, like Mr. Rothman, are saying is a reasonable range?

A. That's right. Actually, we found in various ways of doing this that we ended up with narrower ranges and people said, it couldn't be that narrow, it couldn't be that confident about GDP 25 years from now.

Q. So you went back and reconfigured your approach here, so you got a range at, roughly --

A. No, no. Okay, our approach was changed, that's right.

Q. Yes.

A. We didn't use, for instance, the 25-year history for GDP alone, because that, surprisingly enough, is actually even tighter than this band would suggest.

Q. And you mentioned a few minutes ago that no one else is doing this sort of thing. I take it that you are referring to no other utilities do this?

A. They are very few utilities. I understand perhaps there are one or two others that

have statistical confidence bands for their forecasts, but I do not know whether anybody actually tries to estimate GDP uncertainty, or whether they in fact use a judgmental estimate for GDP uncertainty.

Q. Could you tell us who those utilities are that you are aware of that do a confidence limit?

A. Well, Bonneville Power has a confidence band, and it's actually not very different in range from ours, for a given mean of the forecast. And they use GDP as their major driver. I found this out after the fact. But anyway, I can't say that I know exactly how they get their GDP uncertainty band, but I haven't seen any documentation of a modelling approach to GDP uncertainty. It may be a judgmental approach.

Another group that, on a regular basis for the last few years, has generated uncertainty bands, which is not an individual utility, the North American Electrical Reliability Council, has generated bands using a similar approach. And their source of information for uncertainty on each of the explanatory variables is sort of a Delphi survey type approach.

Q. Mr. Burke, I asked you this and I don't really think I understand your answer. Why do you assume that the population uncertainty that you

have generated just by the population variation from the mean historically and scaled, is symetrical around your forecast?

A. Actually, if you look at the data, it's exceedingly symetrical.

Q. No, I understand why it's symetrical historically around the mean.

A. Yes.

Q. What I don't understand is why you assume that your forecast is--

A. Is a median forecast?

Q. --in the middle of that curve into the future?

A. Because Mr. Rothman tells me he is making a median forecast.

Q. All right.

A. That is, there is an equal chance the results could be lower or higher. That's what a median forecast means.

Q. You have just defined it as such?

A. That's what it is. That's the statistical definition of a median, it is 50 per cent probability above, 50 per cent probability below.

Q. Mr. Burke, I would understand that if you were measuring something, but if you were guessing

something in the future, you can't know that, can you?

A. Well, that's the judgment that these forecasters are making. They are not going to pick the lower bound; their objective is to predict the median.

Q. All right.

A. You can't know it.

Q. So, Mr. Burke, if I understand then, you have left the method of looking at how good or bad your forecasting has been in the past, you have left that in the past, and you have come up with a method which gets you an uncertainty range which you are comfortable with, and the reason you are comfortable with it is you see it as reasonable when compared to this survey you did of the fifteen?

A. No, I am sorry, you have confused two things.

It's only the GDP band that is a question of comfort level. The translation of the GDP band into the load band is a statistical process and comes out of that simulation exercise pure and simple. There is no scaling or any of that stuff goes on at the -- all we have been talking about so far is how we get the GDP band itself, which is the key variable in the load equation.

Q. But the GDP, the uncertainty in the

GDP, as opposed to the uncertainty in the relationship between GDP and load?

A. I don't have a panel that tells me whether my load band is--

Q. I understand.

A. --comfortable or anything like that.

What I do have is somebody, some group of people that have looked at GDP uncertainty. There are not too many experts kicking around who have a big, great feel for what load growth uncertainty 25 years from now is, but for GDP uncertainty, there are a fair number of people who earn their living trying to forecast GDP. And that is the level where we check comfort and all that stuff.

Q. All right. It's at the GDP.

A. Yes.

Q. Don't let me imply otherwise. And the acceptability of your -- rather, the GDP uncertainty that you have, that you fly by these experts, it is a product --

A. No, we don't fly it by the experts. The experts are each asked for their estimate of GDP uncertainty at the 10 per cent point and the median and the 90 per cent point, and it is their results that we are looking at.

Q. But is that uncertaintly that you compare, that you have, that you have generated, that you then compare to their uncertainties, that uncertainty is driven by the uncertainty created by the population technique we have been talking about?

A. You mean the methodology that -- I'm sorry, you have lost me.

Q. Well, I guess maybe it's too obvious, that's why. The uncertainty that you start off with and then go and compare to others--

A. Yes.

Q. --around GDP, is an uncertainty that is in turn generated by the uncertainty you have generated for population, which comes from this technique?

A. That's correct.

MR. ROTHMAN: A. Mr. Poch, I don't know if I am going to be helpful or confusing, but one thing that I think Mr. Burke hasn't emphasized enough, perhaps because it's obvious to him, but I admit that it wasn't to me, about this uncertainty methodology, is that it is independent of the forecast methodology.

That is, were the forecasts to be made by an end-use methodology, by an econometric methodology, would not matter for this uncertainty methodology, and

the purpose of the equation, the GDP load equation, in the uncertainty methodology is not to generate a forecast but to generate a forecast uncertainty.

...

[12:37 p.m.] Q. Yes.

A. And a reason, as Mr. Burke has said, for the attractiveness of his methodology is its independence of the forecast methodology. Because we don't have to rely on whether or not past forecast methodologies have been good. We are looking at this uncertainty methodology as the way we generate the uncertainty band.

You nodded, so maybe I wasn't very helpful. Maybe you already understood all of that. But it me took awhile.

Q. I think you have hit the nail on the head, Mr. Rothman. That is, you hit a real concern on the head.

That is, you have come up with an uncertainty band that is driven by all these assumptions we have spoken of around population, and it has little relationship to all the uncertainties that are embedded in, say, the end-use load forecast about structure, about technology, about everything, except population, and to the extent that that tracks to GDP uncertainty.

MR. BURKE: A. Yes, but that -- you know, all of those uncertainties are captured at an aggregate level in the relationship between GDP and

load. And to get at each of them explicitly and in particular, as we have said, is impossible. I recommend you try it, if you can. It is impossible to do.

Actually, the sort of result you get in aggregate by doing this should be the useful bounding test, to see whether you have adequately captured all the cross correlations that exist within a model, to know whether trends in one direction are independent, or positively or negatively correlated with trends in other variables.

Q. If there is something in your load forecasting, we all get green, and we start doing these differently. That kind of uncertainty isn't going to be captured by uncertainties in your model linked, initially, to this population uncertainty.

A. That is right. And I think the real question here is, and I think Mr. Rothman dealt with that in the context of our GDP forecast in the first place, is that to assume that we all get green, and that makes a big difference, a much bigger difference than is captured by the GDP band that we are starting with; that is, the growth and the economy drops below, I don't know, one and a half per cent a year, whatever the number is, over the next twenty years, that that

would be an event outside the 80 per cent band, and yes, it is not captured. But having identified -- supposing for five years, we are getting greener and greener, and it is obvious, clearly then, we would realign our forecasts, and we'd have a statement to that effect on page 27.

There are, obviously, things; we talk about them and call them low probability, high impact events or trends. These are things that could go on either side of the demand for electricity. That is, I'm not sure that it is clear that there is a systematic preference for being low or high in those events. But there are a wide range of things that could happen, which we are not saying are extremely likely today, which could make a significant difference. And if one of them turns out to dominate, well, that would change things.

Q. You have made one forecast, the key driver is GDP, you have used noise in the historic population performance to generate an uncertainty around that, and you are giving us uncertainty bounds which reflect futures different, if you will, in degree, as opposed to in kind then, because it is all within the uncertainty limits of the model, as you have constructed it.

A. Let's put it this way. Futures that are no different in kind than the ones we have experienced for the last 40 years, since the Second World War.

Q. Okay.

A. And you have observed that there have been some substantial changes since the Second World War.

Q. Right. There is another approach we could take here, is there not? That of a scenario approach, where you look at futures different in kind, but internally consistent, as opposed to simply different in degree?

A. I think I'd like to ask you to clarify what you mean by different in kind, because I think that gets the nub of the issue of why we would look at a scenario approach as opposed to an uncertainty band. It may be trying to do two things.

Q. Well, we have spoken, for example, about the amount of load that is coming from the heating sector, what have you. One such scenario might be a scenario where you assume that by hook-up fees, by choice, by government regulation, by government policy, you avoid that load. And the government does whatever it can, and this would be captured in the basic, I

assume, to get people to be more efficient. That might be a scenario which you could construct, and do what you could to make things internally consistent, correct?

A. Okay, that is a case. Suppose I did construct such a scenario. What would I do with it?

Q. Well, I think you would give it to a panel such as this to look at and give it to the government to look at. Now let me ask you...

A. The issue is, what question was asked? And the question that we have been asked to answer is what do we expect the load to be in Ontario. Not how do we expect other people to develop policies to change it.

Q. Mr. Burke, there is a intermediate type of scenario. If you turn to Exhibit 1.1.4, we have provided a couple of examples.

Are you familiar with the kind of scenario-based planning, or scenarios that are generated by organizations like Shell and like Southern California Edison?

A. I'm very familiar with them. And if you look at the response in interrogatory 1.6.45, Northwatch asked a question like this, and we, in that interrogatory response, indicated that we had

undertaken a scenario exercise that drew on the world at Shell experience, and various ways at looking at scenario building in the early '80s, and the lessons they taught us were planning.

This sort of scenario construction approach is useful to highlight where you need to be flexible, but it doesn't necessarily help you make planning decisions. If fact, I don't think the companies that developed these scenarios, in some sense, use the scenarios for their base plan.

What they use the scenarios for is to know where to build flexibility into their planning. And, you know, the Southern California Edison case, for example, is one where they have a base case just like we do. And the question is, to what extent should they be building on certain flexibility, and to what sort of contingency should they be looking, and so on.

Effectively, we learned that Ontario Hydro is sensitive to a range of load forecasts, and patterns in the way load forecasts go don't really make much difference, if you end up at a certain point twenty years from now. Decision making is such a long-term process, that we could start off -- we looked at scenarios that were very low in the '80s and grew rapidly in the '90s; or were very high in the '80s and

slowed down in the '90s; that were low all the time, high all the time. We looked at energy price shocks of different kinds, for natural gas, for oil, and we learned where we were sensitive and not sensitive. And some things we are not too sensitive to.

And distilling all that information, we concluded that an uncertainty band was a better way to actually go about planning the system, once you recognized that these uncertainties were real, that lots of things could happen, and they could take different forms.

The conclusion we drew at the time was demand management was important, NUGs were important, flexibility was important, planning to be flexible on the approval process was important, all of these things were important. And then it was just a question of developing a plan, recognizing that.

Q. You haven't, for the purpose of this discussion before this Board, generated scenarios that take account of possible trends, such as the example I just gave you a moment ago?

A. You mean the greening example?

Q. The appropriate fuels example, where we have electricity...

A. What we have said is that if anybody

is interested in the answer to a question like that, we would have all the the information required. That is, the end-use models have the sort of detail required, so if you ask Dr. Buja-Bijunas, she can give you the answer. So you don't really have to generate these. There is an infinite number that could be asked for, in terms of who is asking.

Q. I think we already had your answer on the greening example, which is the answer you gave at the outset, which was there was such uncertainty about what that means, you didn't feel competent to construct such a scenario.

A. And there are many versions of it.

Q. Now, Mr. Burke, just finally on this point about scenarios, where you are in a position to choose, or exercise some degree of choice between scenarios, by policy instrument or legislative instrument, or constraints that are within Hydro's power, would you not agree that scenarios would be appropriate then, because you would have some sense of what you are chosing between?

A. Well, you started off your question by suggesting that we had some--

Q. No, I'm saying, if you did.

A. --choices we could make about

legislation and so on, and I think that is really assigning too much to Ontario Hydro.

But, for instance, given that someone suggests standards of certain kinds, we can certainly look at what those are and what those would do. And when people get specific about what they really mean and what choices we are choosing between, certainly there is a lot of analysis that can be done, and it is not that far from -- you know, it is not like we have to start from scratch in some areas, because a lot of that information is very close to being available. It just is a question of people suggesting policy choices. But we don't really -- we are not in a position to make those choices.

Q. You say you are not in a position to make those choices. And we have obviously had some difference of opinion over the last few days about to what extent you have influenced those choices, but I hear your evidence. You are not in the position today, then, to give us scenarios, where the government agencies, regulators such as this Board, make choices in some consistent fashion one way or another? You haven't generated those kinds of scenarios; I think we have no dispute here.

A. I think the answer is we have not

generated those kinds of scenarios.

MR. D. POCH: Thank you. Those are my questions, Mr. Chairman.

It may be possible, although I hope, very unlikely, that I would need to pose some other questions, and perhaps through counsel, we could get some resolution, if the various items we have asked for prove alarming.

THE CHAIRMAN: We will do the same as we did with Mr. Mark about that.

MR. D. POCH: Yes. The only other point is that there were at least, I know, one interrogatory that I'm aware of which we had posed last year and asked be made available for this panel, and wrote since, and unfortunately, wasn't. It was assigned to Panel 4. We will try to, if possible, deal with those type of situations with those panels, but I am just putting that on the record as a concern.

MR. B. CAMPBELL: Is this 4.7.1?

MR. D. POCH: Yes.

MR. B. CAMPBELL: I believe we are almost in a position to give you some answers on that. It relates in part to some questions that came up earlier. I think when we go through the various outstanding items perhaps we can just review that, and make sure

that we're comfortable with having it remain with No. 4.

THE CHAIRMAN: Mr. Greenspoon, you are next, is that right? Would you like to start after the afternoon break?

MR. GREENSPOON: Yes, sir, that is probably good.

THE CHAIRMAN: Probably a better way of doing it. We will adjourn then until 2:15.

Mr. Greenspoon, do you have any idea how long you are likely to be?

MR. GREENSPOON: Well, I am catching a midnight train tomorrow night.

THE CHAIRMAN: That is the length of one band. I must be careful. What about the other end of the scale?

MR. GREENSPOON: I would like to spend tomorrow viewing this beautiful city. So if I finish today, that would let me do that.

THE CHAIRMAN: I suppose that is about as uncertain an answer as one could possibly get.

All right. Thank you. We will adjourn until 2:15.

---Luncheon recess.

---On resuming at 2:17 p.m.

THE REGISTRAR: This hearing is now in session. Please be seated.

THE CHAIRMAN: Mr. Greenspoon.

MR. GREENSPOON: Thank you, sir.

CROSS-EXAMINATION BY MR. GREENSPOON:

Q. I am not sure whom I am addressing this to, either Mr. Burke or Mr. Rothman.

If you could look at interrogatory, 6.29. When I say 6.29, I am omitting the 1, or whatever that is, I think that that's somewhat redundant. Obviously, we are in Panel 1; 6 means that it is a Northwatch interrogatory; and 29 means that it is your --

THE CHAIRMAN: Have you passed up those interrogatories for us?

MR. GREENSPOON: Yes. I prepared eight copies as instructed by Ms. Morrison, and I gave them last week.

THE CHAIRMAN: She may have put them on my desk, but I don't seem...

---Off the record discussion.

MR. GREENSPOON: Q. 1.6.29. Mr. Burke, maybe I will address this question to you.

Looking at your answer to 1.6.29, would it be fair to say that you have some reluctance to do

what - if I can use the word - backcasting, or targeting. And as you say in your last sentence of that interrogatory:

"It should be noted that there is much less risk in targeting the level of net impact of demand management programs than there is in targeting the total demand."

Would that be a fair assessment of the problem that you have with backcasting?

MR. BURKE: A. Well, I think the whole response outlines the concerns that we have with backcasting, and I think also in the direct evidence at the end of that, we had a discussion about some of the issues associated with choosing futures and who should make those choices, and so on.

Q. All right. And as well, in interrogatory 6.45, quite conveniently, you dealt with this issue about an hour and a half ago with Mr. Poch, and I think in fact this is the number, 6.45, that you cited?

A. That's correct.

Q. We asked you if you looked at the models such as those created by Pierre Wack, and you indicate that, basically, you have some difficulty, or that you find there is difficulty with

scenario-casting, scenario-planning, and in the last sentence of the last paragraph you say that it is helpful to define the nature of the plan, but decision-making under uncertainty requires the quantifications of risks, the probability distributions permit.

A. Well, first of all, I want to make clear that I don't know scenario-building and targeting are the same things at all.

Q. I didn't say they were. I asked you a question about backcasting, and you have some problems with backcasting or targeting?

A. Yes.

Q. That was with relation to 1.6.29.

A. That is correct.

Q. Now, I am asking a second question. Do you have difficulty with scenario-building?

A. No. The answer to 1.6.45 indicates we have done a lot of scenario-building in the past. It is just that it has a certain role and the role is not very useful, when it comes to the actual decision-making and assigning weight to particular cases that you might look at.

They are interesting to explore, they gave you useful insights, but past a certain point, you

actually need to be able to assign a probability to the outcomes that you are talking about, and scenarios don't have that property.

Q. You say.

A. Well, I am suggesting.

Q. Fine.

A. They don't. I mean they are a single line forecast. And no single line forecast, even our median forecast by itself has zero probability of it --

Q. Well, you are talking --

THE CHAIRMAN: Please, we have got to be careful, there are two people talking at once. It's hard for us to follow, and and I am sure it's impossible for the reporter to transcribe.

MR. GREENSPOON: Yes, I apologize, I shouldn't interrupt the witness.

Q. But basically, I have a lot of difficulty with the terms and technology of economics. And I am trying to understand, almost from a lay perspective, because my clients are lay people, I mean my clients are people in northern Ontario that are trying to figure out what is this is all about. So I am trying to simplify it for myself so I can maybe explain it to them.

You seem to be doing predictive

forecasting with uncertainty bands, that is what you like; is that...

MR. BURKE: A. I don't think we do it because we like it. We do it because we think it's the right--

Q. You think it works.

A. --thing to do.

THE CHAIRMAN: Please, let him answer the question.

You do it because... ? I'm sorry?

MR. BURKE: We think it's the correct way to go, the right way to approach this problem. That's my answer.

MR. GREENSPOON: Q. Demand side management, is it fair to say that some of the demand side management is in the primary and some of the demand side management is in the basic?

MR. BURKE: A. Well, if what you mean by demand side management is specifically programs that Ontario Hydro either provides incentives for, or as we were discussing earlier, through the transfer of information, like audits and so on, causes people to do things they otherwise wouldn't have done, all of that is supposed to be captured in the movement from the basic to the primary load forecast. And what we try to

have in the basic load forecast is natural evolution of efficiency improvement, and so on, that takes place anyway, whether or not Hydro is offering programs.

Q. So the incentives are found in the primary, the natural's found in the basic?

A. Yes.

Q. The 2,000 megawatts - this phrase EEI, that's what describes that - is a prediction. That's a prediction of Hydro's EEI by the year 2000?

A. Yes, that's what we have set oursevles as a target, and having set that and analyzed it, we think it's a feasible target, and therefore a reasonable forecast to make that we will achieve that target.

Q. And the 47 megawatts -- have I got the right figure? There is about 47 megawatts in the basic? Of that, you actually -- it's really not 2,000, if you split them up -- is it 47?

A. Well, 47 is the number that refers to the impact of standards on -- it reduces the number 2,000 that we had originally set, because the standards that we took into account in the 1990 load forecast had some overlap with the EEI programs. And in taking that overlap out, we reduced the 2,000 megawatts to 1953, I believe it was. And I think we did that more as a

matter of principle than because it makes a huge difference to the forecast. The principle is that as you have standards, there is a certain proportion of the impact of a standard that replaces what the programs were expected to deliver.

Q. Right. So if you look at interrogatory 4.7.17, which is in the package --

THE CHAIRMAN: Is that Mr. Poch's package?

MR. GREENSPOON: I think it is in my package.

Q. Thus the target of 2,000 megawatts of peak reduction was adopted as the forecast for the year 2000. That's the same thing we are talking about; that's the 2,000 megawatts?

MR. BURKE: A. Yes. This is referring to 1988 load forecast.

Q. Yes. So the other interrogatory was 4.7.101. And again, you are talking about the estimate of the demand management for the year 2000 and that it's 2,000; in the last paragraph, the 2,000 megawatts of peak load reduction in the year 2000 was set as a target based on studies completed within Hydro on the potential and attainable induced EEI.

That's the same 2,000 megawatts we are

talking about?

A. Yes.

Q. Now, I understand that in 1986/87, the target was 1,000 megawatts. And in 1988, the Chairman said, Chairman Franklin said, it is now going to be 2,000. Is that right; is that a fair --

A. Well, in 1986 and '87, preliminary numbers were put together for the purpose of the demand/supply option study. We had not really completed a formal estimate of potential. And we had not gone through the same sort of process of looking at individual segments of the market and assessing penetration rates and so on, for individual technologies.

So I think the early number of 1,000 was just something reasonable to start with. We certainly didn't want to have a number that we had to backtrack on later, but it was a starting point for the corporation in looking at demand management.

And most of the studies that underlie the 1988 projection were completed in the years '86/87. So that the estimates -- I think while the year 2000, the number of 2,000 megawatts and the year 2000 was set as a target, and at that time, we weren't clear exactly how we would come up with 2,000 megawatts -- that is, I

think in the plan it refers to a portion which is identified and a portion which is unidentified. Nonetheless, it was considered to be a reasonable target, given the analysis that went on in the years just prior to '88. And as I say, the earlier number, while you could call it a target, in fact it was early days for that sort of number.

Q. The thousand?

A. Yes.

Q. You would be more comfortable calling the 2000 a target than you would the thousand?

A. Yes. I think when the number of 2,000 was set in '88 in the Demand/Supply Plan, that was a target, and it really only became a forecast to the extent that we felt it was reasonable to achieve that target.

Q. What is the difference between a target and backcasting? I don't understand how Ontario Hydro is choosing a target of 2,000 megawatts, and you said that you don't know how you can achieve it, you just think that it is something that's achievable?

A. No. I said in 1988, we weren't sure how we would achieve all of it.

Q. Right.

A. Now we have a much better sense of

where the 2,000 megawatts is coming from.

Q. Right. But it's still nevertheless a target.

A. It's a target in the sense that it's a goal we have set ourselves. It's a reasonable goal to set, because of the considerations that go into assessing what EEI potential is and what the likely penetration rates of our programs is.

So we can account for where we think 2,000 megawatts of savings will come from, on an economic basis. And we can also say that all of the potential that we have identified is included in that. The real issue comes down to what we realistically think the penetration rates will be.

I don't know. It's not like we are postulating a wild, unknown future for the whole economy; all we are doing is modifying electric load at the margin.

...

[2:32 p.m.] Q. It sounds like backcasting to me.

A. Well, I think in the response that you asked me to look at first, 1.6.45, is that right?

Q. No.

A. First one, anyway.

Q. 1.6.45 I raised with respect to the issue of...

A. No, it was 1.6.29, the last paragraph. As you pointed out, I said it should be noted that there is much less risk in targeting a level of the net impact demand management programs than there is in targeting the total demand.

Q. I understand your position.

A. And really, what is involved here is a given electric market, the one that we are forecasting with the basic load, and the substitution of more efficient technologies in specific instances -- the concern we have about targeting as a whole is that you suddenly become -- you are targeting the economy, and the way the economy works. Because in order to really influence electricity demand in the long term, you get into that broader question. And I think it is not like one can say, well, you have accepted the principle for this small thing, you should accept the principle for the whole thing. We are changing

categories on the way.

Q. You are anticipating the whole flow of my cross-examination. But we can come back to that, because I want to talk about that. Obviously, we in Northern Ontario see a different future than you at Ontario Hydro, and we will get into that.

I just want to point out that you are backcasting when you target, even though you say it is one thing to target a small amount, it is backcasting; it is targeting. You don't want to do it to the big amount. I accept that, I accept that is your position. Your answer is on the record.

Let's move on to standards; again, targeting. I think somewhere we talked about a 20 per cent CO2 reduction; even if we didn't talk about it or you didn't talk about it, if there was a target set by the government, a standard 20 percent CO2 reduction, you would respond to that? You would have to respond to that target?

A. Well, we have looked at different ways, at least one or two ways, of responding to the 20 per cent reduction. And in several interrogatory responses, we have filed material from Hydro's global warming studies. There are many ways, though, to respond to that target, and one would have to be much

more specific for Ontario Hydro to have a clear course of action, than to say, "We are now going to achieve that target."

For instance, in Ontario Hydro's studies, the scenarios looked at were assuming that each sector of the economy, including the electric supply sector, reduced its emissions 20 per cent. And that is one way to look at it, but there are other ways to look at it, and they have different consequences.

Q. If you could look at interrogatory 1.6.34, the response appears on a separate page, and at the bottom of that page, much the same as your answer in 1.6.45. But it seems to me, I will put it to you, that you are at least accepting to some extent...

THE CHAIRMAN: 1.6.34 is not in this package.

MR. ROTHMAN: Yes, it is; they are not sequential.

DR. CONNELL: What are we looking for?

MR. GREENSPOON: 1.6.34, Doctor.

MS. MORRISON: It is over the page from 1.6.35?

MR. GREENSPOON: We photocopied on both sides, I think.

MS. PATTERSON: There it is.

THE CHAIRMAN: Oh, I see. Oh, I see; all right.

MR. GREENSPOON: Q. At the bottom of the page, I put it to you, Mr. Burke, that it somewhat expands upon your position in 1.6.45, at the bottom of the page:

> "Given the state of the art, econometric and statistical techniques will be be used to augment our models to account for environmental policy impacts. Initially, such an analysis will have to rely on scenarios about possible alternative government policies, and use estimates of cost derived by studies conducted in the U.S. and European organizations such as the OECD."

So you do accept an expanded role for scenario development?

MR. BURKE: A. I don't think I have ever said that we can't develop scenarios, or scenarios aren't interesting. I have said that, when it came to decision-making in the plan, operationally it made sense to use an uncertainty band, because it allowed you to put some weight on each of these possible futures, without viewing each sort of line into the

future as one of many permutations of possible futures.

In exploring the future, there is no harm, and in fact it is very productive, to look at scenarios. No problem with that. But sometime along the way you have to winnow those down and say, "Okay, which ones do we really believe? What is government policy? Should we be anticipating government policy?" And so on.

Q. The more environmental regulation we see in the future, the more scenario development would be appropriate. The more you have to meet environmental regulation, the more things like the 20 per cent CO2 reduction that we see, the more a scenario that forecast those types of things would become useful.

A. Again, I think, if someone tells me there is a particular target, like, we have set a standard on refrigerators, and it is to save 45 per cent by a certain year, then we are just doing some calculations.

If someone says something specific, like Ontario's industry will have to cut back in certain sectors to achieve a 20 per cent reduction in CO(2) by a certain year, we can do those calculations. We have no problem at all with that. It is getting to the

stage of what it is that people really mean. What are we talking about? What specifically makes a 20 per cent CO(2) target real. And I can assure you, you can get completely different results for the implications for electricity demand, depending on how you set about achieving that particular broad goal.

It is not a question of target-setting or anything, or some problem with scenario-building. As soon as we are specific about this, we can analyze it.

Q. All right.

A. Until we are, it is just very vague.

Q. All right, let's get specific. Let's look at 1.6.14. I take it from your previous answer, and the answer in 1.6.14, that you haven't predicated anything upon a sustainable development scenario.

MR. ROTHMAN: A. Not on sustainable development defined as such, as I talked about in my evidence in chief.

When we talk about about a scenario, I view a scenario as essentially an alternative forecast. What we try to do when you try to describe a scenario is to describe an alternative future. Since our forecast is essentially a description of a future, then a scenario is essentially an alternative forecast.

The way you build a scenario is to take

off from some set of assumptions that differs in their driver from the assumptions that you used to build the main forecast. So that a scenario has, presumably, a whole set of all the forecast variables that follow some path.

As Mr. Burke has been saying, that kind of look can be useful for some kinds of thinking about the future. When you construct a scenario like that, when you construct an alternative future, you can say, "Well, what happens if..." That is really where, as Mr. Burke has been saying, we have the ability to answer at least some kinds of what-if questions, of the kinds that you have been posing, of the kinds that Mr. Poch was posing.

What if there is no more increase in electric heating level, no new electrically-heated houses? We can answer that question.

What if, as you have just posed, what if the Ontario pulp and paper industry were to shrink by an average of five per cent a year as a result of a commitment to sustainable development? We can answer that question.

And it is useful to have the ability to answer such questions. But for the purpose of developing the plan, what we needed was the kind of

forecast that we have, which is a forecast with distinct probabilities attached for the distribution in each year.

Because there is a difference between saying, "I can describe a scenario. I can describe the answer to what if some set of policies that I might infer from what the Canadian government would do with monetary policy differ from the current forecast were to occur." We can describe that. But I can't assign a probability to it, because it is an alternative forecast. It is a single forecast.

Q. But it is also an alternative to the undertaking.

MR. B. CAMPBELL: Whoa, whoa, whoa, whoa; just a minute. I think we are getting right into section 5(3) here, and what in the end is argued as a legal conclusion of what constitutes an alternative to the undertaking with respect is not for these witnesses to say.

THE CHAIRMAN: All right, I think that is right, Mr. Greenspoon.

MR. GREENSPOON: all right.

MR. ROTHMAN: So, now...

THE CHAIRMAN: You say you can't - I have gotten in the middle of Mr. Campbell - you were just

making the final point about you can't ascribe something to something?

MR. ROTHMAN: I can't ascribe probabilities.

THE CHAIRMAN: Probabilities to a scenario?

MR. ROTHMAN: To a scenario, because it is a single forecast, and, in fact, it has a zero probability.

THE CHAIRMAN: But if your forecast today is a scenario, you do assign a probability to that. So why can't you assign probabilities to another scenario?

MR. ROTHMAN: I don't assign a probability to the forecast, I assign a probability to a range around the forecast. The forecast itself has a zero probability; that single forecast has a zero probability.

THE CHAIRMAN: You can do a range from a scenario, too.

MR. ROTHMAN: What does that range represent?

THE CHAIRMAN: I don't know.

MR. ROTHMAN: That is the problem. I don't either. And that is why we have trouble assigning probabilities around a range of scenarios.

We have wrestled with this problem in the past. There have been times in the past where we have had scenarios, to which we assign probabilities. Saying each of those scenarios represented, as you have suggested, the centre of some range of outcomes poorly defined. And we started to get questions about, okay, where does the range for scenario A end, and the one for scenario B begin? Because we had scenarios, whose probabilities added to 100 per cent.

And those are just some of the kinds of problems that you would get, that we have found, with trying to do scenario-based forecasting.

THE CHAIRMAN: Sorry, Mr. Greenspoon?

MR. GREENSPOON: If we could move -- I mean, I don't want to interrupt.

THE CHAIRMAN: Was there something else you want to say, Mr. Rothman?

MR. ROTHMAN: I just want to go back to...

MR. GREENSPOON: There is a point here of order.

THE CHAIRMAN: I think I'd like to hear what Mr. Rothman has to finish up with.

MR. ROTHMAN: I just wanted to go back to the original question, Mr. Greenspoon, which was, have

we put scenarios on sustainable development into this forecast? And the answer to that is largely getting back to where I was. That is kind of, for us, a what-if question. And the what-ifs haven't been well enough defined yet, for us to produce a single reasonable scenario.

MR. GREENSPOON: Q. All right. So I guess that leads me to the next point, and that is about judgment. Because that is what you are talking about. You have to make a judgment whether the what-if is well enough defined for you to deal with. You have to make a judgement, and let's look at some of the interrogatories here, to talk about judgment.

Let's look at interrogatory 1.6.4. Last paragraph on the second page:

> "Hydro's median load forecast does not presuppose major changes in government policy. The potential for such changes contributes to the uncertainty associated with the forecast. The corporation does not devote resources to examining all possible futures. Rather, it relys on the judgments of the people that build the models and recommend the forecasts that the risks are evenly balanced in the

selection of the median forecast."

And 1.6.26, last sentence of the first paragraph:

"The increasing weight on the lower of the two model projections in selecting the basic load forecast reflects in part a judgment that government policy will promote efficiency improvement in the use of energy somewhat more actively in the past."

And there is a couple more. There is 1.6.33 and 1.6.34.

You have to make judgments in all of these things, I put to it you.

MR. ROTHMAN: A. Certainly.

Q. You have to judge which model you are going to use, you have to judge penetration rates of EEI, as Mr. Burke said. Do you agree with that?

A. In both...

Q. That those are judgments?

A. Yes.

Q. You have to judge natural EEI. That is a judgment.

A. Not really.

MR. BURKE: A. No.

Q. Mr. Burke, you said no.

You have to judge what inputs you put into the end-use model. That is a judgment call.

MR. ROTHMAN: A. We have to judge, as I think we said explicitly, we have to judge what government policies will occur, and the sustainable development policies are a good example. We have not judged that there is either a sufficiently defined set of policies, to be clear about what implementing sustainable development means, or a clear government commitment to implementing such a sustainable -- such a group of policies--

Q. Well...

A. --to put them into the forecast.

Q. In Exhibit 115, did you see the -- you have seen this. The Coalition filed this. You don't have to look at it. But the purpose, the purpose of this document is to provide a foundation for implementing sustainable development in Ontario.

MR. BURKE: A. Yes, but as I understand it, the round table, I'm not sure what its relationship to the Ontario government is, but it is an advisory group. And it is presenting proposals; those are the first round of proposals as of last fall. They have not been evaluated by anybody. Nobody has said how far

they are prepared to go with any of it. It is a good collection of concepts for sustainable development in Ontario. But I think to push it much further than that...

Q. Well, the chairman of this committee is Ruth Grier. She is the Minister of the Environment. She says:

"The purpose of this document is to provide a foundation for implementing sustainable development in Ontario."

When I read that, I think we are now on the road to sustainable development.

MR. ROTHMAN: A. Yes.

MR. BURKE: A. Yes.

Q. You haven't forecast a scenario involving sustainable development.

MR. ROTHMAN: A. Mr. Greenspoon, I think this is a good example. Look, as we talked about with Mr. Poch, look on page 28. It talks about the atmosphere. And there is a section called "Directions For Change," under which is a set of actions. Those actions include: Increasing energy prices to reflect their full environmental cost in a manner that is sensitive to maintaining the competitiveness of industry in the province.

I don't see that as any guide which I can use to understand what will be likely to happen to energy prices in the province. It may well be that under that, energy prices could be increased significantly, under someone's calculation of environmental cost. It might be that they wouldn't be increased at all, because that would not maintain the competitiveness of industry in the province.

So I just don't see that, within this context, we have a set of policies clearly enough defined for me to answer the question of what if.

Now if you are suggesting that we could take it upon ourselves to define those sets of policies, and then answer the what-if questions, I suppose that is feasible, but probably not a terribly useful exercise.

Q. No. Well, yes, and the problem I have there, too, is that there has to be a basis for all of those judgments. I mean, it is the people in your division that are making these judgments. And you don't know whether sustainability is going to raise or lower, because you said that in direct. You think that it could have either impact. You are not sure what impact this is going to have on the forecast, even if we go that way. You have said that.

A. On the load forecast.

Q. On the load forecast.

So I guess the question I have is, who is in in your division? I mean why don't you have people who examine sustainability and look at that?

...

[2:57 p.m.]. A. Because we have not had -- let me start again. As I said, we have the ability to have answer the "what if" questions. Mr. Burke, Dr. Buja-Bijunas and others have worked very hard to get us the ability to answer those "what if" questions.

It's not a simple task. I haven't thought that it is our job to define, at this level of environmental interest, what those "what if" questions should be; that is, what "what ifs" we are to analyze.

Q. All right. Some of the things that struck me that were not in your forecast, that I thought might be important to the people of Ontario about a future, if that's what we are talking about, were things like education, literacy levels, health, infant mortality. And I should preface this by saying that it's the different values, it's not just the sustainable future that I am talking about that you haven't forecast; it's a return to the values of family and community that we value in Northern Ontario that I think your forecast misses.

A. The connection between those values and the forecast is a difficult one, I think, to understand; that is, you are suggesting values like education, like health, could influence the level of economic activity in the province, and I don't doubt

that. In effect, the forecast assumes that we will have an education system that provides the workers who are skilled enough to be able to be productive as we have assumed.

As I have said before, we assume that the average worker in Ontario will become increasingly productive, and that that rate of productivity growth will accelerate as we get farther out. One basis for that assumption is that Ontario government and employers will be more willing to invest in education, in training, for each worker because there will be fewer of them. So that's a sense in which we have incorporated some assumptions about education into the forecast.

You have suggested that we incorporate some family values into the forecast, and again, one of the things that we have to forecast is the number of people per household. And we have forecasted an increase in the number of people per household, which would imply more people living in family situations, or at least a trend, a change in the trend away from people living in family situations. But these connections are not very direct, and so we make them, but we are not as explicit as you suggested about where they are, when we write the documentation.

Q. For example, when you talked about productivity, it struck me, not in a negative sense, but there is a tendency in your forecasting to relate good with positive and with growth, and bad, I think it is implicit, with negative growth. And it struck me when you said productivity, that it may be that the people of Ontario decide that they can do with less. And it's not a matter of productivity but in your narrow parameters it is.

Do you know what I mean? What if the people of Ontario decide that they don't want to work a 40-hour week anymore, maybe we should only work a 20-hour week and we can do with less. You haven't forecast any of that.

A. No, we have not forecast declines in the real output of goods and services, in order for the province to consume more of other kinds of goods, at least in a way that changes radically from previous patterns.

The history of industrialization has been one of increasing consumption of leisure time. That is, as societies become wealthier, individuals work less time. And I would say that a forecast like that is, again, implicit in our forecast. But as I said earlier, we don't have an assumption in our

forecast that there will be a significant break from previous patterns in the degree to which Ontario chooses to have lower emissions and less measured economic output.

Q. Yes, so it's based on more of the same, because you said, it's got to be based on the past; otherwise it's witchcraft, your forecast is; and you wouldn't want to do that.

A. Well, I wouldn't characterize it as witchcraft.

Q. No, I wasn't, I wasn't.

A. Yes, I know that you were not.

We base it on what has happened in the past, and our judgment about will happen in the future. And as I said, there is an implicit assumption that there will be choices to do things like reduce emissions, but that there will not be a significant break from the direction of previous such choices and essentially the rate of previous such choices.

Q. All right. This might be a good point for me to look at, and I didn't make this an exhibit because it is an exhibit. It's exhibit 47, for the record. You don't have it in front of you.

That's the piece by Lars Kristopherson that you filed; it's Exhibit 47 filed by Ontario Hydro.

You don't have to look at it. I just want to read you a --

MR. B. CAMPBELL: Just a minute.

We have had no notice that this is going to be referred to, and I am not sure that it was referred to in any of the material that this panel was responsible for. I am not sure whether they even have it there. And I think it is quite unfair to ask them to comment on a piece without any opportunity to see it ahead of time.

THE CHAIRMAN: What is it, by the way?

MR. GREENSPOON: It's no big deal; I don't have to use it. I can ask the question without it. It's one of Hydro's exhibits. When Hydro files an exhibit, I thought it's an exhibit. Do I have to give notice if I am going to use the DSP?

THE CHAIRMAN: I think, generally speaking, if you are going to use a document like that, it would be a good thing to let them know in advance that you are going to ask questions about it.

MR. GREENSPOON: All right, I won't use it.

Q. In that document, I am not going to refer to it - (laughter) - but let me put it to you in my own words. Let's suppose there is not enough to go

around in this world, and --

THE CHAIRMAN: That's not enough of everything?

MR. GREENSPOON: Of everything, yes.

Q. Certainly, there is not enough for all of us to live like we do in Ontario. You are shaking your head. You agree with that?

MR. BURKE: A. I am just absorbing your example at this point.

Q. Do we not have an obligation, maybe, to look ahead in the future and to realize that there is not enough to go around, and that maybe a good start would be to get our own house in order in this global community, and say that we can live with less?

MR. ROTHMAN: A. If I believe that, I believe that I, as a member of this society, have an obligation to work towards that end. But I don't think that I, as a forecaster, have an obligation to incorporate that into the forecasts, until I see enough people as members of this society working towards that goal, that it becomes, in our judgment as forecasters, the most likely outcome.

As I said before, I think I may also have an obligation that, even before it reaches that stage, when it becomes a likely possibility, and a well enough

defined one that we can answer the question, we should be able to answer the "what if" question. "What if" society does change in this way? And we have worked hard to be able to do that.

But I don't think that I, as a forecaster, have an obligation to put that into my forecasts until it becomes the most likely outcome.

Q. But the impact of saying that, it's not a matter of degree, I put it to you, because, if we need a lot more, like you say we do, then we need lead time because we need mega projects, but if we need maybe just a little bit more, we can take these things off the shelf. We can take a 3 megawatt reactor or a 6 megawatt generator off the shelf -- reactor was a slip of the tongue.

Do you know what I am saying? That it is not as simple as what you say, that it is just a curve that we can adjust. Because you at Ontario Hydro, it takes a long time to pour cement, and you have got to pour cement, you need to forecast; the forecast has to be accurate. If you wait until it's definite that we are looking towards sustainable future, you may have wasted a lot of money and a lot of energy in the wrong direction.

And I put it to you that better

forecasting would be small, quick, and cheap, given, I mean, it's like --

MR. B. CAMPBELL: Sorry, I have no understanding of what this question is all about.

If you are talking about forecasting small, quick and cheap, is he talking about the forecast itself? Or are we talking about the responses to the forecast? I think we are stepping well beyond forecast here into a planning response to the kind of choices that are required. But I am afraid that if we are talking about the forecast, I don't understand where this question is going at all.

THE CHAIRMAN: The question has a certain argumentative quality to it, but I think perhaps, if you could just rephrase it to take that element out of it.

MR. GREENSPOON: All right. I apologize for being argumentative, sir.

Q. I guess what I am going at is there is a qualitative, as well as quantitative, difference between these types of forecasts, because if you forecast high, there is a long-term ramification; if you forecast low, we don't have to rush into anything because we can build these things slowly. A one megawatt hydraulic generator becomes more significant

in a low forecast. Do you agree with that?

MR. ROTHMAN: A. Mr. Burke, I think, wants to make some comments as well.

I think I want to get back to where I started, which is that it may be valuable to the planners for us to answer those "what if" questions. They may be able to draw useful inferences from scenarios that we might build along those lines. But it is, again, not part of our most likely or median forecast.

Q. Yes, Mr. Burke?

MR. BURKE: A. No, no.

MR. ROTHMAN: A. I have dazzled him, I am surprised.

Q. I have some specific questions. I think I referred to interrogatory 1.6.42, did I? Have you got that? Maybe that was in the Coalition. Yes, that's in the package from the Coalition.

I must apologize. My clients are very sensitive to the use of paper, because the trees are something that we rely on and live with, and I have tried to eliminate the amount of copying that I have done.

THE CHAIRMAN: 1.6.42 was in the package that Mr. Poch put in with the interrogatories.

MR. GREENSPOON: Q. Now, these are graphs that you kindly prepared for us, and I am referring to about six or so pages in to the interrogatory. It's the graph entitled "Ontario Hydro Load Forecast, Peak Demand 1972 to 1981." And at the same time, I would like you to have a look at this generation proposed in program LRF48A that I gave out. It's a matrix.

MR. B. CAMPBELL: Perhaps before we have questions on that document, could we have the date and what it's drawn from, please?

...

[3:08 p.m.] MR. GREENSPOON: Thank you, Mr. Campbell.

It is from a document called "Generating Station Site, North Channel," and it is Ontario Hydro's submission to the Royal Commission on Electric Power Planning, December 1977.

THE CHAIRMAN: Perhaps for identification purposes, Mr. Greenspoon, you could give it the next exhibit number. Can you give this document...

THE REGISTRAR: 1.1.7, it is.

THE CHAIRMAN: 1.1.7?

THE REGISTRAR: Yes.

MR. GREENSPOON: Thank you.

---EXHIBIT NO. 1.1.7: A document called "Generating Station Site, North Channel," from Ontario Hydro's submission to the Royal Commission on Electric Power Planning, December 1977.

MR. GREENSPOON: And I will undertake to make a copy of the whole document, although I'm not referrring to it, if it is necessary.

THE CHAIRMAN: You don't need to, unless anyone wants you to.

MR. GREENSPOON: Okay, I have a copy anyway.

THE CHAIRMAN: If that is consistent with your desire to reduce paper...

MR. GREENSPOON: Great. Thank you.

Q. Would it be fair to say that there is a parallel with these two documents that we are looking at? I see one, maybe there isn't one.

MR. BURKE: A. Well, in 1977, the forecast was a lot higher than it is today, and so there were plans put together - there seems to be a summary of it - which had a lot more generation planned for the period to 1990, certainly, and beyond, than is likely to be realized.

So certainly, when you have a high forecast, and you plan to meet it, as in this case, which was supply-side resources, you get a high result. I think it is instructive that as the forecasts came down, most of the units on this page never materialized at all.

Q. So we could draw a line under about the seventh line down where it says "Darlington"?

A. Yes. Well, I think it has the fourth unit of Darlington in 1988, and I think now, 1992 or '3 is the station.

Q. And -- sorry.

And in 1977, you were forecasting according to that chart in 28 more Candu units by the year 1997. Twenty-eight, if I add up all the Ns in the

second column. Do you agree with that?

A. Yes, I think we discussed the fact that the forecast has fallen significantly between the mid '70s and today. In fact, fell very rapidly between the mid '70s and the early '80s, and we spent a lot of time on that this morning. I agree that plans consistent with those two different views of the future are very different.

Q. I wanted to get into some specific industrial uses, motors. Is that your field, Doctor? Would you be the one I should be addressing about motors?

DR. BUJA-BIJUNAS: A. Yes and no. That is a really clear-cut answer.

For our forecasting, we forecast by process, as opposed to end-use equipment. So, for example, for the pulp and paper industry, we would forecast the use of craft pulping, TMP, those types of paper-making machines, and typically, how much energy is used per bone dry metric tonne of product, but not explicitly in terms of motor load.

Q. So, am I accurate when I say that about 76 per cent, I think, of your industrial load is motors?

A. Certainly, yes, currently.

Q. Currently?

A. That is not to say we disregard that 76 per cent. We slice it in a different direction.

Q. Well, you analyze it in a different way. You don't have a book that you pull off the shelf that tells you about motors or forecasts that way.

A. No. What I'm saying is that one can either look at a process, which might be 50 per cent driven by motors, 50 per cent driven by some other end-use equipment, and talk about the process energy use, in kilowatt hours per tonne. Or alternatively, you can slice the entire industry in the other direction, and disregard the processes and talk about how many motors there are out there.

We have grouped things like process, which encompasses equipment, all within a given process. It makes it more difficult, therefore, to ascribe exactly how much is in motors, but all the motor load and lighting load, et cetera, is all covered off in the process approach.

Q. Sure, and it works for forecasting, but I put it to you that what it doesn't do is it doesn't allow you to generically address efficiency issues with respect to motors in your forecast.

A. The answer to that is, also, yes and

no.

Certain processes we have done that. Certain processes in place right now, we have given them a kilowatt hour per tonne efficiency currently. We have lowered that value for future capacity pick-up. Same process, but we have just assumed that the efficiency of that particular process will be somewhat more efficient in the future. If that process is primarily motor driven, for example, inherently you are assuming that you will be picking up high efficiency motors as a partial replacement for the motor load. So the process intensities change in the future to represent the change in efficiency of equipment being used to run that process.

In some industries, we actually are extremely specific, where we directly forecast by saying so much is motor load, so much is lighting. They are the non-indepth industries where we do large cross cuts by major equipment type, as opposed to looking at all the processes, because it would be too involved to do that.

Q. All right.

A. So we do have some explicit consideration of motor loading in the industrial forecast.

Q. Are you familiar with an agency called Competitek in the United States?

A. Yes. We most recently looked at it from the point of view of technology available for the commercial sector, but yes.

Q. They are quite expert, I understand, in motors and efficiency of motors, those kinds of things.

A. The various technologies available, yes.

Q. Right. There is a big payback in motor efficiency, given the 76 per cent that you have agreed to. If we could cut that in half, that would be a significant impact.

A. You used an operative word, "if." And I guess if you are running that scenario, if one were to, by some means, cut that load in half, yes, given that mode, it would account for 75 per cent.

But one thing I will say right away, you have to know the feasability of this, and you have to look to see what horsepower range the various motors are in. Typically, over 200 horsepower, you are really dealing with high efficiency motors, and so you won't be getting that 5 to 8 per cent improvement with that motor load.

TMP, for example, uses very high efficiency motors, high horsepower motors. So in that particular industry, you are not looking at that efficiency improvement. You've got to be very careful exactly what makes up that 75 per cent, what horsepower range you are in, and, therefore, what your savings are.

Q. Now I wanted to ask you, Doctor, about some of the specific things we do in Northern Ontario. I gather that there are people on your staff that go to Algoma Steel and go to Inco and Falconbridge and E.B. Eddy?

A. Not in the load forecast department, no.

What we do is that we do interface with program management division in energy management branch. These are the people that have more of the connections with the field, with the regions, et cetera. So we use their input regarding what is going going on out there. That is one input.

The other thing to realize is that, when we put together indepth models, we have consultants bring these models together, these data bases together, and these consulting groups were chosen because they do have an intimate knowledge of the various pulp and

paper plants, the various iron and steel plants, et cetera.

So what we wanted them to do is to give a very good representation exactly what was out there, so that our models would, as closely as possible, represent all the equipment out there, and how these mills do run their operations.

In addition to that, when it is comes to updating our assumptions each year, we keep track of, through various data sources, if some plant is closing down or increasing the capacity, due to a new process, or any other problems they might have in mind. So we do try to keep track of these things.

Q. Well, for example, let's look at Algoma Steel. I understand that they put out a lot of heat in their process. It is an old, a very old process; not very modern. And my information is that there is a lot of cogeneration potential.

Aside from whether it is economically achievable, given the rate structures, is a matter for another panel. But are you aware, is your department aware, of cogeneration availability at Algoma Steel? Is that something that is on the shelf?

A. We are aware of the amount of load displacement cogeneration currently in place, which you

have to subtract from our demand forecast to get our load forecast.

As a department, we get our future forecast of load displacement from the NUG, non-utility generation division, that looks at the economics of various alternatives.

Q. Right.

A. So that series of numbers, that forecast of load displacement is given to us from that group.

Q. So maybe the question that I should ask is, if I say that there is 300 megawatts of cogeneration possibility at Algoma Steel, is that the figure you used in your forecast?

A. If that is the figure that the non-utility generation people have in their forecast, a future load displacement or current load displacement, then that is the number we have incorporated in our forecast. We rely on these people, since that is their responsibility, to put together that.

What we do is put together a forecast of demand, what is required out there to produce their products. The NUG people have the responsibility to give us the other set of numbers.

Q. So you don't have that number

available here today.

A. How much cogeneration Algoma...

Q. How Algoma Steel is forecast to have.

A. The amount of cogeneration, I don't have it with me. You would have to ask the non-utility generation individuals.

Q. Are you going to give me the same answer when we talk about the trees? Right now you know that there is a major environmental assessment of the timber in Ontario. Are you aware of that that?

A. What sort of environmental assessment do you mean?

Q. It is called the Class Environmental Assessment on Timber Management in Ontario?

A. I'm not directly aware of the details.

Q. You are not aware of it, okay.

Well, it is a parallel to this, I guess. Just as this hearing is going to look at electrical forecasting and demand and management and the future for Ontario Hydro, this is an undertaking that is put forward by the Ministry of Natural Resources. And it is asking another panel of this Board to decide what the future of the trees are, the forests, and how we are going to harvest them.

If that panel determines, as I put to you is not outside the realm of possibility, that we are running out of trees, how have you forecast that into your load with respect to pulp and paper industry?

A. Our pulp and paper forecast has an underlying assumption regarding the output production of our pulp and paper industry. Predicated on that is the assumption that there will be a certain amount of virgin fiber, whether it is soft wood or hard wood, to supply the furnish of those pulping processes. So the assumption is that industry remains competitive, and the assumption is that fiber will be available to produce production at that level.

Q. Let me put then to you, maybe to the three of you, this, because that I think focuses on the issue of throughput. I see that - and maybe you should correct me if I'm wrong - the three of you, and perhaps the whole forecasting department, seem to see this as a cycle. That economics is basically just production and consumption. And that there is, if I could use the word throughput, no cost for resource depletion, in other words, that we run out of trees. And...

A. No, there is.

Q. Just a minute, let me finish.

That you are not taking into account

resource depletion, and you are also not taking into account the cost to the environment, the impact that the pollution is having on the actual environment.

A. When it comes to resource depletion, one of the underlying assumptions is total capacity of fiber within the province. So that there certainly is not production beyond the total amount of virgin fiber, whether it is hard wood or soft wood, in the province.

Now that doesn't address your second question, which is what's the cost...

Q. Environmental impact.

A. Yes, the cost of that fiber. From an engineering perspective, you need a certain amount of fiber to produce a certain amount of final product, considering all the yields and losses, et cetera, of fiber as it goes through the various processes. So from an engineering perspective, the fiber is there.

I'm not addressing your second issue.

Q. Well, how do you know the fiber is there? What do you base that on?

A. From a number of consultant studies which look to see how much fiber is required to produce one bone dry metric tonne of newsprint, fine paper, tissue paper, sanitary paper, whatever it is that has to be produced, and looking at the various yield ratios

of various processes available currently in the pulp and paper industry.

MR. GREENSPOON: Now I had some specific questions with regard to the pulp and paper industry; maybe I will come to those later.

This might be a good time to break.

THE CHAIRMAN: All right, take a 15 minute break.

---Recess at 3:25 p.m.

---On resuming at 3:41 p.m.

MR. GREENSPOON: Thank you, Mr. Chairman.

Mr. Chairman, Exhibit 47, that I didn't give my friend notice on, I anticipate that I will be probably another hour in the morning, and I have discussed or shown Mr. Burke the exhibit, and of course, they have the exhibit back in their office. I have asked the clerk to provide copies to the Panel for tomorrow, and apparently that is all right with my friend.

THE CHAIRMAN: Thank you.

MR. GREENSPOON: I'm going to be using the transcript volumes 2, 3 and 6.

MR. B. CAMPBELL: Could we have a moment? We're going to have to get the extra copies. I have one copy here, and I would like to have one in front of

me, and I'd like to get the others.

THE CHAIRMAN: The Panel doesn't have a copy of the transcripts?

MR. B. CAMPBELL: I don't believe so.

MR. GREENSPOON: I have never been in this type of a hearing. In my experience, it's not usual that the witness has a copy of the transcript.

THE CHAIRMAN: I think it is better that they have it. In fact, even in civil proceedings, if they are starting to refer you to discoveries, I let the witness have the transcript. I think it is a lot easier.

MR. GREENSPOON: It is probably a good idea. I didn't know if it was my obligation to provide transcripts.

THE CHAIRMAN: No.

MR. B. CAMPBELL: No, it isn't. It is just if you can tell us, then we can be organized for it. I'm afraid you have caught us out, with our not having enough copies.

THE CHAIRMAN: We will take it easily, as we go along.

MR. GREENSPOON: All right. The beginning is...

MR. B. CAMPBELL: Are you starting at 2?

MR. GREENSPOON: I'm starting on 2.

Q. Mr. Rothman, I'm doing this in chronological order. You were the first witness, or you were the first respondent to the questions. And at the very beginning, you talked about, on page 281, the self-correcting nature of the economies.

I guess I wanted to sort of get your views and your opinions on that self-correcting nature of the economy, and how that relates to the forecasting itself, and what values do you bring forth to make those judgments?

MR. ROTHMAN: A. This one, I think, is more technical, rather than value driven. Essentially, --

THE CHAIRMAN: You are talking about "this one," meaning this forecast? Is that what you mean?

MR. ROTHMAN: This expectation that market-oriented economies tend to be self correcting.

THE CHAIRMAN: I see.

MR. ROTHMAN: And by self correcting, I mean that significant deviations from economic growth, at the rate of growth determined by long-term potential, will bring into play forces that will ultimately cause a correction in growth back towards

potential growth rates.

I don't see that as having a judgment or a value statement in it. It is simply to say the economy has some rate of growth of potential. If we get over some short- or medium-term period of time growth significantly above that potential, it creates supply stresses in the economy. Those supply stresses ultimately lead to some kind of correction. It might be recession, it might be more severe than that, it might simply be slower rates of growth for a period of time. But the economy will correct, as a result of stresses set up by the excess of demand over supply.

On the other side, if there is an insufficiency of demand over a long period of time, then prices of the factors of production will adjust, and eventually, growth will resume bringing the economy back closer, or back to, its long-term potential output.

It is harder sometimes to see the corrections when there is insufficient demand, because we have a market-oriented economy, but not a complete market economy. So that some prices are difficult to adjust downwards, and it can take longer, or be rougher or stickier for the correction to occur, when there has been a long-term or medium-term excess of supply.

But ultimately, and we have seen it happen with the market-oriented economies, ultimately, they do come back towards potential.

...

[3:45 p.m.] Now, where there is an implicit judgment made is in a forecast of potential. What I said was that there was some potential and we come back to it, but in forecasting potential, we have to use judgment about what will happen to those factors that determine potential.

MR. GREENSPOON: Q. If you could turn, following up on that, to page 286, your answer to Mr. Campbell's question about whether you see any radical breaks, you say:

> "We don't forecast any radical breaks from past patterns of industrial development and industrial output in the economy. That doesn't mean that we assume that all past trends simply continue, that whatever way the economy was going in the past, it will continue in that direction. We look at the reasons it has gone in certain directions in the past and try to forecast the future from that."

But it's very conservative, it's safe. You say it, you say, we don't forecast any radical breaks from past patterns of industrial development. So you have forecast a scenario of more of the same

with a bandwidth, no consideration of a different alternative sustainable future for this province.

MR. ROTHMAN: A. We have not put any forecast deriving from an assumption of radical breaks which might or might not associated with a move toward sustainable development into the forecast. That's not to say we haven't considered such possibilities. We haven't put them into the forecast.

Q. I wanted to ask you about on page 290. I think most of my questions on the transcript, really, are not necessarily that anybody has to refer to the transcript, but I guess I will continue to quote what I am looking at.

At line 10 you say -- or the question:

"The third factor you mentioned was immigration...."

What I am interested in is what you have looked at in terms of immigration to the north or to the south, because it seems as though most of the people are immigrating to the south. We don't have a lot of people coming north. Have you looked at the impact of immigration in that regard?

A. No.

Q. I will come to that later.

As well, not referring to the transcript,

but it just strikes me that in one of the interrogatories, I don't remember which one, Hydro indicates that they don't have, really have, a regional component to the forecast. Is that fair to say?

In terms of northeast/northwest, I think that's what you call the north, you have divided them into two sections, and then the south. You really don't predicate your forecast on those regional components?

A. We have tried to look at some better ways to do forecasts of areas within Ontario. We do have such forecasts for the purposes of system and transmission planning, but they have not been based on the kind of detailed forecast considerations you have heard described with respect to the end-use forecast, for example.

MR. BURKE: A. I wasn't sure to begin with whether you were talking load growth forecast or GDP forecast on a regional basis.

Q. Those and more.

A. The load forecast itself is prepared on a customer level for the first five years of the forecast period, and in a lot of the NAN Treaty 3 - is that the right way of describing it? - interrogatory responses, we have given a fairly comprehensive

collection of whatever information we really do have about load in the north. And we produce what we call a west system load forecast report, which really refers to the northwest region, but it is the sort of an almost independent system from the east system that essentially supplies the remainder of the province.

And that material, I believe, has also been submitted, and I could find for you the references in interrogatories to specific Northern Ontario load forecast information. Because while we don't have perhaps economic forecasts by region, the customers themselves supply a solid base for forecasting in the short-term. And, because the north has a dominant position in certain of the major industries in Ontario, we use the end-use forecasts for specific large industries, like pulp and paper and so on, to guide the forecast for the north, and essentially try to use as much information as we have about the north.

Certainly, when we are deriving the west system forecast, the northeast region, we don't have as much information about, and have tended to include it certainly when it gets to the longer term in the analysis we do for the east system as a whole.

Q. But in terms of the economic impact of your plan on the north?

A. Well, the economic impact of the plan is not really an issue that the load forecast itself addresses.

Effectively, we are charged with forecasting the demand for electricity in Ontario and also, for transmission planning purposes, the location of that demand within Ontario. But if load is growing in one part of the province and not in the other, issues that result out of that, for planning purposes, are not ones that we deal with; the planners essentially deal with that.

Q. On page 296, Mr. Burke, you say on line 6, that in the 50s and 60s -- I'm sorry, Mr. Rothman, line 6:

> "You can see that in the 50s and 60s, there was quite high productivity growth in Ontario. That was a period when Ontario was industrializing."

The thing that struck me about that, right off the bat, was that the north was already industrialized. I mean, when you go look around Northern Ontario, the plants were all built in the '20s and '30s and the '40s, and a lot of them are still running on that technology.

So in response to Mr. Burke's last

question, I put it to you that it's a mistake not to look the economic impact of your plan on the economy of Northern Ontario, that the efficiency of this industrialization in Northern Ontario is obsolete, and we are running out of resources, and you don't seem to have studied any of that.

MR. ROTHMAN: A. Hydro does study the economic impact of its plan. What Mr. Burke said was that it's not part of the load forecast.

I don't think we have done a specific impact study of the Demand/Supply Plan as a whole on Northern Ontario. We have done a study, an aggregate economic impact study, for Ontario as a whole of the Demand/Supply Plan. We have not included considerations of the kind that you are raising.

Q. I was taken by your comment on page 298 about environmental regulations, and I can tell you that Northwatch's view is that environmentally appropriate technology is --

THE CHAIRMAN: First of all, what comment was that?

MR. GREENSPOON: I'm sorry, line five.

Q. Where you seem to indicate that environmental regulation will negatively affect productivity growth. It's Northwatch's view that

environmental technology is the kind of thing we want in Northern Ontario to give us a stable base.

Did you not consider that perhaps environmental regulations and the technologies associated with that would, in fact, give us a positive productive growth?

MR. ROTHMAN: A. I said could negatively affect productivity growth, and that's the reason it's "could" instead of "will," is that there are in fact, in some cases, environmentally more benign technologies that are more productive than the existing technologies.

In one example, I think - maybe Dr. Buja-Bijunas will correct me - is the switch to thermal mechanical from chemical pulping, which both reduces effluents, reduces the amount of chemicals needed, reduces the effluents, reduces their toxicity and increases the fibre yield, increases the amount of useable fibre that you get out of a tonne of input fibre. So, certainly, a technology like that does go in those directions.

Q. Okay. Now, I wanted to ask you about your definition on page 314, at line 18, about sustainable development. And your definition is, I put it to you, very much what the Brundtland Commission

says, that we not borrow from the future, that we not impact. But what does it mean to you, personally?

I mean, aside from reading a definition, everybody is becoming more environmentally aware. You nod your head; I mean, I would assume that you probably are, as well. You are in a corporation of forecasting obviously, forecasting the future has to involve some environmental awareness, and you have said that in your evidence that you are aware of that. What does it mean to you?

A. Well, I have done a little wrestling with that, and I am not sure.

I suspect, personally, you have asked for my personal opinion I think, so that's what I am giving you, I suspect personally that truly implementing this sustainable development concept, as stated here, would require a very radical change in the pattern of life that we have in North America. When we think about the concept of throughput, that resources are extracted, converted, and ultimately disposed of, and put that in a context of: we should not be creating that throughput at such a rate that it impairs what future generations will have available; it seems to me that at some point you come down to try to get close to zero throughput.

Well, we have a very large throughput

now, and reducing it significantly would, I think, require a very significant change in the way that we live.

Again, my personal opinion is that's why I am very skeptical about what really mean by a commitment to sustainable development principles.

Q. Now, you talked about the Green Plan on page 315 and top of page 316, and I think that goes along with what you are just saying. I think you you say in there that it is not clear how far the federal government is going to do with its Green Plan. But don't you get the message from the provincial government that they are more serious about the environment? The Round Table, I quoted the foundation of sustainable development for the future of Ontario?

Why did you focus on the Green Plan, when you answered the question on sustainable development rather than where your boss, if I can use that crass phrase, but I mean really, the government of Ontario is your boss. It appears to me as though the boss is saying, we are committed to the things that you are not sure of. Why did you focus on the Green Plan and not the province?

A. Because I think the Green Plan is closer to a set of definable policies. As we have

talked already about this Round Table Paper, it really is a discussion paper, rather than a move towards a set of policies, which I view the Green Plan as being closer to.

Q. You know that the Green Plan is regarded by the environmental movement as -- well, not very highly. A lot of rhetoric. Are you aware of that?

A. Well, I read the press reports, just as a...

Q. All right. I wanted to ask you about a comment that you made on page 325 of the transcript. You like Free Trade. You think Free Trade is going to be good for us, is that what you are saying?

A. When I say a positive force and good effects, in that transcript reference, I am talking strictly in terms of the impact on GDP, a total output of goods and services in Ontario.

And you're right, there is an implicit value judgment in the use of those words that more GDP is better, and perhaps I should not, in that context, have made that implicit value judgment, but that's what is there.

Q. Also, I mean, I don't think you should apologize, that's what you believe. You said

it, I was here when you said it, you sounded like you believed it.

A. Well, I said that when I talk about increased GDP or increased output, I am talking about what gets measured as GDP, and --

Q. "Positive force and its good effects - its good effects - may take longer than we expected but will come."

A. Yes, I meant good effects in terms of total output.

I guess where I am hesitating is to say that I don't think that unlimited development, in the sense of unlimited output of goods and services, whatever its other consequences might be, whatever its non-market consequences might be, is a good thing. But that is a personal judgment, not a professional one.

Q. Now, on page 333, Dr. Connell asked you about the trading blocs, the Uruguay round. Would about if we moved toward smaller trading blocs? More of the informal economy. If the economy became based more as it was in the past on community economics; have you examined that kind of a scenario?

A. What level of community might you think about?

Q. Well, I guess you can't jump from one

place to the other. I am asking you, when Dr. Connell asked about the impacts that the Uruguay round might have, I guess what I am asking you is what about an impact that going the other way might have, where instead of blocs becoming bigger, blocs became smaller; where maybe we started being more self-sufficient in Ontario in food production, for example?

A. Well, we could.

I like bananas. If Ontario were to try to become self-sufficient to banana production, it would be possible but very expensive. And it would seem to me that, in general, we are better off with wider trading areas, simply in terms of efficiency. If we are going to eat bananas, it is a much better use of total resources within the society to have them grown in climates where they can grow outdoors than to use energy in Ontario to create an indoor climate to grow bananas.

Q. Mr. Burke, on page 365, top of the page, Mr. Campbell, seemed to have asked you a question out of order; is that correct?

...

[4:02 p.m.]. I don't mean this in a pejorative way at all, but you were following along. I just want this on the record.

He was asking you questions from a book, and you had a similar book, and you were answering the questions in the order that was expected. That is what I took from that. Is that fair to say?

MR. B. CAMPBELL: Well, just...

MR. BURKE: The direct evidence was anticipating a certain line of development of the questioning, and at this point, yes, the question was not what I anticipated.

MR. GREENSPOON: Q. Dr. Buja-Bijunas, on page 387, you are talking about refrigerators getting bigger.

DR. BUJA-BIJUNAS: A. Yes.

Q. Do you know about the Sunfrost refrigerator?

A. You will have to explain what exactly you mean.

Q. I think it uses about 180 kilowatts a year.

A. Kilowatthours, I hope.

Q. Yes, kilowatthours. Yes, kilowatthours.

Did you forecast that perhaps you would start using those kinds of things, or are you basing your forecast on consumerism and that we all want a bigger fridge and we want to have the automatic defrost?

A. There were two things that were incorporated in the forecast for refrigerators. When I looked at the efficiency level, which is the very engineering sense of efficiency, not demanding larger refrigerators with more features, that is the utilization aspect, but strictly the efficiency aspect, we looked at a number of studies by people like Shipper and Geller, et cetera, in the United States, and we looked at the efficiency improvements in refrigerators over the last, let me think, going back until about the early 70s. And using that information and studies by people like Geller again, regarding the likely efficiency improvements in the future, we came up with our forecast of efficiency improvements for refrigerators. This is without standards. This is just based on the normal evolution of normal technologies.

Then we separately also looked at utilization aspects regarding people buying larger refrigerators, and that was based on CAMA studies,

Canadian Appliance Manufacturers' Association. We had information on the sizes that were sold, the relative population of models, the relative weighting of sizes that had been sold in refrigerators over the last 20 odd years and the evolution of size over that period, and the likely evolution in the future. So it is a combination of those two aspects.

Now, I must emphasize that the way the end-use models currently operate, and what we are trying to get more detail in, is the fact that now we forecast efficiency on end-use perspective. What I mean by that is for refrigerators, we will look at the entire end use of refrigeration, and we will look at models, et cetera, but we will aggregate that and give efficiency improvement to, say, three per cent per year and translate that into, say, two per cent in the future.

We don't specifically look at a particular model of refrigerator in the future. We are end-use specific, not necessarily technology specific. But most of the development that we are doing currently for the end-use models is to allow us to bridge that gap and to go into that sort of analysis.

Q. It is a lot like the same like some of the lines of questioning I have had with the other

two witnesses, that you can't really do anything radical, because it is really not in the realm of forecasting.

A. What I am saying is that we have looked at a number of sources, primarily in the U.S., where you have people like individuals working on the standards at the Lawrence Berkeley lab, looking at the costs of putting in things like evacuated panels in refrigerators, the cost of putting in two to three inch insulation in the walls and the door of the refrigerators, the acceptability of this to people, and have come up with what they feel is a likely efficiency improvement in the future, and we have used that information for our forecasting.

Q. So a scenario that saw, for example, a refrigerator that used about one-tenth, like the Sunfrost refrigerator, and I am not a salesman for them by any means, but a scenario that has that kind of efficiency, where we might even manufacture that in Northern Ontario, for example, that is not incorporated in your forecast?

A. It is not incorporated in the forecast, insofar as it was not identified as a likely economic alternative technology.

Q. I understand. Now, I wanted to get

back, I am in Volume 3 now, Dr. Buja-Bijunas.

MR. GREENSPOON: Do they have it?

MR. B. CAMPBELL: No. I'm embarrassed to say we don't evidently have a Volume 3 available. Perhaps if we could borrow one.

MR. GREENSPOON: This first question, at least, it doesn't matter.

MR. D. POCH: You can borrow mine.

THE CHAIRMAN: Here is one. All kinds of them coming out.

MR. B. CAMPBELL: Great, then maybe I can have one to look at, too.

MR. GREENSPOON: Q. On page 405.

Really no particular reference. It was just to jog my memory about the four industries that you were talking about in that overhead, and I think actually you helped me with that graph that morning. You were explaining I think at the recess about what the keys were for that graph.

DR. BUJA-BIJUNAS: A. Yes.

Q. And along the lines of the question I asked earlier about Algoma Steel, we are curious in the north about some of the other big industries and how you have examined them. Inco, for example, uses a lot of electricity, and I understand that they put a lot of

heat out in their process. A lot of heat is wasted. Do you have figures for that, the potential cogeneration at Inco, and how that has been factored into the forecast?

A. As I said before, yes, we do subtract load displacement from the total demand forecast to yield the basic forecast, because that is what Ontario Hydro must supply. However, we don't do the forecasting of load displacements.

What I will mention, though, is that our end-use forecast does go to the people, to the non-utility generation people, so that they have a knowledge of what sort of assumptions we have built in regarding the operation of Inco, Falcon Bridge, Abitibi Price, et cetera, so that things aren't out of whack in terms of our assumption regarding production levels of these industries and their assumptions regarding cogeneration capability, which is connected with the industries. But we take what they give us regarding that load displacement.

Q. You had said that you thought we were looking at about 33 per cent recycling.

A. That is right, by 2015 and beyond the forecast period.

Q. Now again, isn't this out of whack

with what the province is saying? Along the lines of how I was questioning Mr. Rothman, that in the sustainable future, the sustainability, or as they call it in the budget, Mr. Laughren is using the phrase sustainable prosperity now, that they are calling for 50 per cent reduction of waste.

A. Oh, yes. I think it is a matter of how you are interpreting this. Just as in the United States there are a lot of states that have legislated the amount of recycled fibre that must go into their newsprint, and that typically averages 50 per cent, in some states 40 per cent. It varies somewhat.

Having one-third recycled fibre use in our newsprint does not preclude the newsprint sold here in Ontario having 50 per cent recycled fibre. The majority of our newsprint is exported into the United States. We are saying that the local market is better able to supply them with the recycled furnished fibre, but there is still always a demand for virgin fibre newsprint. Part of that demand is the fact that is you can only recycle fibre so many times before it breaks down irreparably and doesn't give you enough quality product to retain colour, print, et cetera. So that that need is always there.

We are looking towards furnishing our

export market preferentially with virgin fibred newsprint, but given the extent to which we supply the Ontario market, you can still do that with the one-third recycled.

Q. But you are on the conservative end. The 32 per cent is conservative.

MR. B. CAMPBELL: I'm not sure -- what does that mean? What are you saying?

MR. GREENSPOON: Low.

MR. B. CAMPBELL: Low? You obviously have something in mind. I think it is only fair to the witness to say low in comparison to what. It is certainly higher than today.

MR. GREENSPOON: I think the question is perfectly clear.

DR. BUJA-BIJUNAS: Thirty-three per cent is the value you get using the scenario regarding competitive advantage, the extent to which you can recycle fibre, and how much of our fibre ends up being exported. It is the logical amount, given that scenario.

MR. GREENSPOON: Q. But again, the Class Environmental Assessment on Timber Management that you didn't know anything about until I told you about it, if it finds that we don't have enough fibre, this could

be right out to lunch, the 33 per cent. If we find out that that is it, we can't cut any more trees, that there aren't any trees left to cut, that we might have to take a year or two off, it is going to be 100 per cent recycling, isn't it?

DR. BUJA-BIJUNAS: A. As you use the word again, "if" again, I think there is an untold number of scenarios that start with the word "if" that would change our load forecast.

What was done here was looking at the fibre resource, the relative yields of processes, and that information to yield the final years.

Q. But you are the forecaster for -- sorry. You are the forecaster.

A. I am forecasting the most likely forecast.

Q. You are the forecaster that is telling me about the pulp and paper industry, and you don't even know that there is an environmental assessment of timber in Ontario.

All right. What about high quality scrap? I have got some interest in scrap. Just one question. Is the quality of scrap related to the impurities, it that --

A. That is what I was referring to.

Q. That is what you were referring to.

A. High quality means low residue.

Q. But is that like if there is too much -- like for example in a car, there is too much plastic?

A. That's exactly right. It is not just the plastic, it is other metalic residues, also. And as a result of that, you can't cold roll or galvanize steel, and most of the demand for, say, the automotive industry to increase their product is for the higher quality of steel. That is what I was referring to.

Q. So that could be a mechanical process that could correct that. It is just a matter of separating the good stuff from the bad stuff.

A. There have been various ventures over the last, I don't know, at least five years that have been trying to develop this simple process, and they are not yet successful at doing it.

Q. Right, okay. Now I'm turning to Volume 6, page 994. Mr. Burke, I think, line 4. You were answering one of Mr. Mark's questions.

MR. BURKE: A. Yes, I have it.

Q. What do you base that judgment on? You say there that:

"Well, you face a hard decision, Mr.

Mark, whether you wish to cut your data set off at some point and ignore the last four or five years of information, or model with it and then try to judgmentally correct for it."

And just so I can get it clear in my mind, remember what it was, you were talking basically about whether in the sign curve, I guess, whether you cut it off at the peak or you cut it off at the valley.

A. Well, I think we are talking about the commercial construction history, which showed a rapid increase toward the end of the historical data period, and I had suggested that with the data set that ended in about 1989 or '90, depending on, I guess, well for the econometric, if we did not have 1990 data when we prepared the 1990 load forecast at the end of '89, we were ending on the upswing of that cycle, and that was one of the, I think, several factors that I cited as to why the econometric model might be forecasting high, or higher than we would like to see as the ultimate -- as the recommended forecast for the commercial sector.

Q. So what do you base your judgmental corrections upon?

A. In this case it is a pretty technical

point. We're essentially saying that if we -- I suppose that the truly rigorous way of doing this would be to forecast both ways, and look at the difference and see where we think the results should come out. In the sense of hypothesis -- I suppose, the way one could do it is, there is two ways. We can either take history off or add simulated future results, so that you could say, "Well, if in fact the commercial sector does not expand very rapidly in the next few years, and we were to forecast on that basis, where would that lead us?"

But I think this was just one of the many considerations in viewing econometric forecasts for the commercial sector as much too high, and we cut it back significantly by the end of the period.

I think it is a directional thing that we are getting out of this observation. That is that because the data set ended on a cyclically high point, we would expect that to, other things being equal, bias the forecast up slightly than if we happened to have a data set that proceeded through and moderated the growth of the commercial sector by several years of what we are now going through, which is a much more modest growth.

Q. Well, just following that then, let's

look at 1027, where you talk about judgment again, maybe in a broader perspective. And what I want to know, what my question was, and I guess I didn't frame it very clearly, is what values do you bring into your judgment, when you make these judgments? Either for the cut-off point, or in this case you say:

> "...to assess whether that is a valid assumption is something which judgment might be used for."

What values do you bring to your job of forecasting and load determination? Or do you not bring any values? Is it totally cold scientific analysis?

A. Frankly, we try to be as objective as possible about this. There is no doubt about that, that this is not a question of my bringing my personal values as to what I would like to see Ontario looking like 25 years from now, and I'm now going to steer the province on my personal view for the future. Far from it. I'm trying to look at what information about how the load has worked in the past in Ontario, how that bears on the future, and we describe the various kinds of information we are going to bear. The judgments are essentially when the information is approximate or uncertain or not clear-cut, where you make a decision.

I think I said somewhere in one of the interrogatories that you referred to that one of the many reasons to shave the forecast down from what you would have gotten with the pure econometric forecast versus the end use was the view that government policy would favour efficiency gains in the future.

That is, again, not a quantified assertion as to what in the basic load forecast I would expect to see by way of the impact of efficiency gains from changes in government, but just another consideration, but I don't think it should be my personal values that come to bear on the forecast.

Q. I didn't want to suggest that -- and I think obviously you were overstating the case. Nobody has that power, even if you wanted to do that, you couldn't do it. I think that is obvious.

...

[4:27 p.m.] But my question is that when you make those judgments, I appreciate that it is a fine-tuning, but there still are some values that you bring to this, just as I asked Mr. Rothman, and he indicated that he thought free trade had some positive and good, not just positive and negative, but good impacts. You have to have a vision for the future that implicitly, I put to you, you have to put in your forecast. You can't help but do that.

MR. BURKE: A. Well, no. Frankly, my own vision of the future is something I try to keep out of the forecast, because as you said, I am not in any position to bring the future about as I personally might like it to evolve. I may have a complete scenario of what I would do if I were running Ontario, but what I have to take into account is what I think will in fact happen, given the trends and what has happened, and where we actually see policy direction going.

You would have to admit, there hasn't been over the last 20 years in Ontario, a vast move towards the imposition of standards for appliance efficiency or building codes, and so on, in Ontario, and after the time we prepared the 1990 load forecast we have started to see some policy statements from a

new government with intentions to do some things.

In terms of looking at what has happened, I cannot honestly say that the province is about to embark on a radical program, at least at the time that the load forecast was being prepared. There isn't much evidence that that was happening. However, maybe a year or two from now we will see things quite differently. But at this point, at the point that the forecast was being assembled, that is in the early fall of 1990, there wasn't that much to work with.

My personal views as to whether the government should or should not move in certain policy directions really don't bear on the issue.

Q. Well, except it scares me when I read what you said at page 1054, that I accept that that would be great if you didn't bring anything to bear, but when you say something like:

> "If everybody in the world chose to adopt these principles, Ontario might find it easier than everybody else to adopt these principles. We might be better off than everybody else. Everybody might flock to Ontario to do this sort of -- to live here because, environmentally, one could meet stringent

regulations here."

A. Well, frankly, that is a consideration you have to bear in mind. One of the first articles that I saw in The New York Times about the impact of global warming, was the population of Canada in 2100 will be 200-million people and this was based on the view that climate change would in fact make Canada a more desirable location than it used to be.

We may not want to have 200-million people in Canada in the year 2100 but somebody has to think about it a little bit to see whether in fact it's part of our future. There is nothing wrong with considering whether or not the changes that are going on in the world, that's one example, and it's not the example I was referring to here, but that in terms of environmental sensitivity, it's not clear cut that everything reduces Ontario's opportunities and activity levels.

It may be, that as we have stated before, it matters a lot what our trading partners are doing as we move to sustainable development. If we are the only economy that is regulating itself very hard and imposing high prices on itself in order to achieve sustainable development goals, then it will have

perhaps a negative impact on GDP. But it's not inconceivable that other economies may have to regulate themselves even harder than we regulate ourselves in order to achieve the same results.

It's not clear cut in advance how the global pie, essentially, will divide up and where the outcome will be. We haven't done the analysis, I can quite admit that. We have not done a global scenario of where sustainable development takes everybody else and Ontario. But I would just - almost to be difficult about this - suggest that there are outcomes that are not necessarily the obvious ones.

Q. Oh, a hundred per cent I agree with you. I don't think we can tell what the outcome is going to be at all and that's my point.

A. Well, that's my point, too.

Q. But you have chosen a scenario with a bandwidth, haven't you?

A. Yes, an 80 per cent bandwidth.

Q. An 80 per cent bandwidth. But you have chosen it.

A. Well, we have developed it.

Q. And I put it to you that it is just as unlikely that global warming is going to make Ontario an attractive province, or likely, that is no

more -- that is even more speculative, I put to you, than the possibility of the Round Table's vision of a sustainable foundation for Ontario signed by the Minister of the Environment. I put it to you that's more much likely than a scenario that you just put forward.

A. It's quite conceivable that both are mutually compatible, but we haven't analyzed it yet. People really have taken this very far at this point, and I think it's premature to judge how it's going to all net out. And unfortunately, that's why we are left in situation that we are not able to say that we are on the verge of a radical departure yet. At some point we may feel more comfortable with that and there may be much more specific policy directions in place that enable us to do the sort of analysis that it takes to assess the issue. I am just saying it's too early at this point.

Q. Now, what about, Mr. Rothman, you said, and I don't have a reference, and if you don't agree with your saying it you can just deny it, but I think you probably will stand by it, that nobody has as big an interest in forecasting as Ontario Hydro?

MR. ROTHMAN: A. I said that we have a more direct interest in long-term forecasts of the

Ontario economy than other forecasting agencies do.

Q. But you would agree with me that we all forecast? I mean everybody forecasts in big and small ways. We all have a very deep interest in the future. In terms of its size, maybe Ontario Hydro has a bigger interest because it spends more money, but we all forecast, don't we? Don't you agree with that?

A. Yes. We forecast we will be alive tomorrow, too.

I am not sure where you are going.

Q. Well, do you mean, when you say Ontario Hydro has a big interest, or the biggest interest, does that imply that they do the best job at it, or does that just mean that because they spend so much money they have the biggest interest?

A. I think if I had to be much more precise, and I think you are asking me to be much more precise, what it is that I meant, I would have said that Ontario Hydro has a larger monetary interest in the long-term forecasts of Ontario than does any other single decision-making organization that I can think about. The other possibility might be the provincial government, but its interest tends not to be as long-term as is Ontario Hydro's. It's focus tends not to be as long-term, perhaps is it a better way to say

it.

As to your point that everyone forecasts, that's true. Most people's forecast horizons for their individual planning tend to be only sporadically long-term.

I don't know. If you want to talk about personal forecasting, you look like a man in your forties or so, I don't know how good your pension planning is, what is your 25-year forecast for yourself?

Q. I guess we have a different view of the future.

When I talk about forecasting, I guess what I am getting at is that there are some things that you can over-forecast.

Well, I will give you this statement. You don't need a weatherman to know which way the wind blows. When you walked outside last night, at least when I walked outside, the way we forecast in Northern Ontario - I am only talking about the weather - the wind was from the south, and now it's warmer today than it was yesterday. I mean, there are some forecasts that are just so obvious. Do you agree with that?

A. The statement you don't need a weatherman to tell which way the wind is blowing is

related to what is happening right now, not what will happen in the future, but what is happening right now.

Q. Right.

A. And your suggestion is that there may be some things in the future that are obvious, but I would suggest that even some of these long-term things that have been considered obvious in the past, if we look back at them are not so obvious now.

Economists like to amuse themselves at the expense of our own profession by going back to the 1960s when quite respectable economists were writing about the end of the business cycle. There would be no more business cycles because economists had learned how to manage the economy well enough and had persuaded politicians well enough that we knew how to do that, that there would be no more business cycles. Well, that turns out not to have been true and not to have been a correct sort of consensus view, even within the economic profession of the future.

The future that might have been imagined in the 1960s for the 1990s is the generation that were the Flower Children of the 1960s. One might not have expected that they would become the Yuppies of the 1980s and 1990s, yet that's what happened.

So your suggestion that there are

societal trends, which is where I think you are going - or maybe not - your suggestion that there are societal trends that are obvious to everyone and that any reasonable forecast would forecast these societal trends to continue, I think is wrong.

We do look at what look to be real changes in the way a society is going, and we try to accommodate them. I am not suggesting that the environmental movement that concerns with the effect of economic activity on the environment are of the nature, the transitory nature of the Flower Child movement and the Hippies of the '60s. I think that's a permanent change in values within the society, and I think that we will continue in the direction of concern for the environment. That's effectively in our forecast.

What we don't have in our forecast is a break in that concern.

Q. Is a what?

A. Is a radical acceleration of that concern.

Q. So you have it in your forecast but it has no impact because it's not significant.

A. No, that's not true. It does have impact in the forecast.

Q. Up to 2000 megawatts.

A. No, no. That's a separate set of policies and actions.

Q. Where else is it in your forecast?

A. It's effectively in the productivity assumptions already.

Q. But with the caveat as we discussed before, that it doesn't take into account the possibility that Ontarians may see a shorter work week, less productivity, less GDP, as a desirable future, that the distribution of wealth, sharing of more, may be something that is seen as being the best thing for the people of Ontario.

A. I don't know for sure. I would guess that there is a shorter work week already built into that forecast, already built into that forecast of productivity. A radical change in the direction of seeing less measured economic output as good is not in the forecast.

Q. Okay. I wanted to turn to the Demand/Supply Plan. I take it my friend won't have any objection to me referring to that? I don't know what the exhibit numbers are.

I had a general question that's been sort of bothering me since I saw these and I don't know who can answer this, but why was the environmental

analysis printed on recycled paper and the plan itself not? Is that a stupid question? Does anybody know the...

MR. B. CAMPBELL: I don't know that I would put it in the category of a stupid question. I think I can try and explain to you the rationale as it was given to me, but I am not sure that it is anything that this panel can help the Board with, so I would be pleased to have that discussion with you later.

MR. GREENSPOON: Maybe that could go on the record at some point, because I think it is significant for us in Northern Ontario to know why Ontario Hydro thinks they can do this, and not on recycled paper.

Q. Looking at Chapter 3...

MR. BURKE: A. Of the main report?

Q. Of the report. I guess it is maybe pretty obvious to you that what I am getting at is, what is the corporate vision and what is your personal vision, and is there is a vision in forecasting? I mean, it's the link from judgment to vision that you people are unwilling to make, it seems to me.

THE CHAIRMAN: I would have thought they had answered that many, many times this afternoon, but if you want to have a go at it again, you can.

As I understand it, they take their position as being forecasters and they forecast what they think is appropriate to put in the forecast, and they don't make any personal judgments about that. That maybe too much of a caption, but that's generally what their position is.

MR. GREENSPOON: Yes, I agree.

...

[4:44 p.m.] THE CHAIRMAN: However desirable some other scenarios may appear to them personally.

MR. GREENSPOON: Q. Now I'm looking at the first statement on the top of page 3.1:

> "Many services needed by the people of Ontario are provided by electricity. Residential customers need to wash clothes, refrigerate food, cook meals and maintain comfortable temperatures in their home."

Why did you use the word need in this? Are these not really just uses of electricity and not needs? Isn't that a value judgment? I mean, isn't that -- isn't that a vision that this is how Ontario works, and that we need this? Isn't that an assumption?

MR. BURKE: A. I think it was intended to be synonymous with demanded in this case. That is, people want variety of services. I wouldn't read a whole lot more into it than that.

Q. Well, you say at the bottom of page -- line -- well, line 30:

> "Forecasting demand, while it uses analytical tools, is essentially about people's lifestyles, values and

activities in society."

How can you forecast that without making a judgment about the changes that we are going to see in the future, the environmental changes?

A. Well, I think we have gone over this ground. I think that we essentially have said that it is not clear what the impact on the load forecast of all of these changes, especially environmental changes we are talking about, are at this point, because we do not have an explicit statement to work with about what environmental policy changes are being seriously considered. And that is within the context that people are obviously advocating that we move towards sustainable development. That we consider CO2 emission reductions and so on. But it is not clear yet where that takes us.

Q. But you are using the word "lifestyles."

A. Well, the fact is that the forecast, I mean we were trying to put a human side to this process, because it is trying to capture the summation of a very large number of activities that people undertake. And if people, for instance, choose to heat their homes to 20 degrees or 18 degrees or 22 degrees, this is a lifestyle choice, you might say. And we'd

have to make a judgment about that in our forecast. We have got a certain number in there implicitly for the amount of heat per household.

It is not explicit. We didn't get, you know, right up a tree as to the statement about the value judgment that went into that. But effectively we had to make some assumption about amount of heating per household. And one of the things that goes into that is this aspect of lifestyle.

Well, that is the sense in which we clearly have to take it into account. It doesn't mean just because we consider these aspects that if we see the possibility of a radical shift, we should immediately build that into a most-likely future.

Q. But what about on page 3-4? I'm looking at the pictures. And Mr. Rothman said that we are producing -- you say we are producing more now per farm. And I mean, obviously you must be aware of the fact that we are producing more per farm, but the farms are a lot bigger. But I think what you did -- you did also, I think, implicitly in that say that generally, overall in terms of GDP, the agricultural output is up per farm.

MR. ROTHMAN: A. I had said per agricultural worker, per farmer, rather than per farm

necessarily.

Q. But again, getting back to the sustainable future or the sustainability or the sustainable prosperity, does that take into account what it is we are producing? I mean, even given that you like bananas, as you say, and you don't want to eat necessarily what we produce in Ontario, the reality of it is that we might have -- we might in the future have to eat what we produce in Ontario. That we might find that that is a more sustainable way to live.

Have you valued that in your forecast? Have you evaluated, for example, how much of our food we produce now, how much of our food we produced in 1950, and where we are heading with that?

If we want to, by the year 2000 or 2025, be self sufficient in food, is that taken into account in your forecast? And I can tell you that in the '50s we produced about 90 per cent of our food, and now we produce about 40 per cent of our food, because people want bananas.

A. That is right. We didn't produce bananas in 1950, either.

Q. We ate turnips, onions, carrots, potatos a lot.

A. I'm not sure exactly what this

question implies, but we have not taken into account a significant shift that would be required in Ontario's industrial structure, were Ontario to focus on autarchy in food.

Q. So when you say agricultural development aided by electricity continues to be part of our economic growth, I don't understand that. What does that mean?

A. I'm not sure what you don't understand. I thought the question -- the statement was fairly clear on its face.

Q. Well, I guess it is pretty clear on its face, but I don't understand where that -- where you see that heading. I mean, I think it was in Dr. Buja-Bijunas' data where we found out that a lot of electricity is used to brood chickens.

DR. BUJA-BIJUNAS: A. That is right.

Q. So that is what it is. That is what agricultural is. Agriculture is the way it uses electricity. That is how you analyze it.

MR. ROTHMAN: A. That is how I analyzed it for the load forecast.

Q. For the load forecast, right. So there is no consideration about a future of sustainability and self sufficiency in food production

in Ontario in the load forecast.

A. Neither the economic nor the load forecast assumes the kind of change that might be implied in the agricultural sector of Ontario to produce the quantity and variety of food stuffs that would be needed, were Ontario to eat -- were Ontarians to eat only food produced in Ontario.

I'm not sure what they might look like if we were to do that, but we don't have it in front of us.

Q. Nor does it include the preservation of agricultural lands and the impact that would have on the economy.

For example, if the government of Ontario were to say, "It is enough. You've got to stop paving over this good farm land down in Southern Ontario, and let's get the people moving up to Northern Ontario, and let's start preserving the farm lands in the south."

I mean I was out in my backyard yesterday where I'm renting, and we haven't got soil like that in Northern Ontario, and you are building subdivisions on it up here, and the government maybe, might say in the future that, "We have to start preserving these farm lands." I think it is a likely possibility that you are going to see the end of this scenario.

And your load forecast, if you look at the second picture, there you are, there is a subdivision on farm land, on page 3-4. And it is more of the same. It is more. And I'm telling you, I'm putting to you that it is not going to happen, and you haven't forecast for this change.

MR. BURKE: A. Can I just observe that if we in fact did have our subdivisions in Northern Ontario, the tendency would be we would be using more electricity as a result.

Q. Well, that depends, you know. Depends on how they build the houses, doesn't it?

A. It depends a bit on how they build the houses, but in practice heating requirements in Northern Ontario are more substantial than in the south. So even if they build the houses the same in both places...

Q. Well, I can tell you my electrical bill goes down every year. Not in amount but in kilowatt hours.

A. I just wanted to observe something that you added to the discussion. That was self sufficiency and sustainable development. It is not clear to me in everybody's view of sustainable development that self sufficiency is necessarily one of

the features. And that is one of the issues, in fact, that does have to be resolved, whether in fact that is a part of it or not. It makes a big difference, and again, as you pointed out, it certainly would have implications.

MR. GREENSPOON: I have one more point, perhaps before, if I could.

Q. The third picture on that page, I see that SkyDome all lit up, and I see all those lights on, and I think it was my friend, Mr. Burke, who put a bracket around after the word "high" and "and." And so it read, "A world-class city has high energy expectations."

I guess we in the north want to know, does Ontario Hydro see these environmental impacts on the north justifying these expectations, these high energy expectations? And have you forecast the impact of a world-class city maybe having a lower economic or lower energy expectations?

---Off the record discussion.

MR. ROTHMAN: I think we are back, we are back to a similar question, which is that we have not forecasted a significant change away from the style of life that we now have in Southern Ontario, or in Ontario, sorry. In Ontario, all of Ontario.

And there is an implication here that the load forecast -- that the activities implied by the load forecast, the results of what are in this plan, which you seem to be attributing at least in part to the load forecast, could produce effects within the Ontario economy that could change the economy in some way that would make the load forecast no longer valid.

I think that is the kind of mechanism that you are trying to get to. That somehow there would be -- that the growth, the implications of the level of economic growth, level of economic activity, the rate of economic growth implied by this forecast, would go back to a self-correcting economy, would set in motion some set of factors that would correct against that. That would reduce the rate of economic growth, reduce the rate of growth and goods and services measured GDP, therefore potentially reduce electricity demand, but we don't know, because we don't know how it would work. And that we should take that into account in the forecast.

I think there is a feedback mechanism of that kind that you are implying exists. And if you're asking whether we have taken into account such a feedback mechanism in the forecast, the answer is no. We have implicitly assumed that there are resources

available within Ontario for the output to be available, and we have implicitly assumed that there will not be policy decisions by the governments of Ontario or of Canada that would make a significant enough break with past patterns to make what is in the forecast not happen.

MR. GREENSPOON: Q. I think that answers the question.

MR. ROTHMAN: A. Pardon?

Q. I think that answers the question.

MR. BURKE: A. Could I add something? I think there are two levels to this issue. One is that, as I suggested earlier, we do produce a load forecast for Ontario, and I think your concern is that in meeting the demand that is envisaged by the load forecast, it has implications for Northern Ontario, and so that should be something taken into account in the load forecast.

My view is there should be something that should be taken into account in the plan. And that if there are implications of the plan to meet the demand for electricity, that impact on Northern Ontario that you don't like, effectively I suggest the planners are the people to address that to. But it doesn't change the demand that we see arising in the basic load

forecast for Ontario.

There may be many ways of satisfying that demand for electricity. All we are trying to do in estimating the basic load forecast is to get that number right first, and then there may be -- you may have a different way of addressing that. But it is not really a load forecasting question per se.

Q. Well, it was. I mean it was whether you had it in the forecast. I think -- all I was saying in the preamble to the question was that we are going to feel the impacts, and that is why we really want to know the right answer to the question, whether you have forecasted that maybe Southern Ontario could grow a little bit slower, or maybe it doesn't need these high energy expectations.

MR. GREENSPOON: That is maybe a good point to stop. I imagine I will be done by the morning break.

THE CHAIRMAN: Thank you, Mr. Greenspoon. We will adjourn now until ten o'clock tomorrow morning.

THE REGISTRAR: This hearing will adjourn until ten o'clock tomorrow morning.

---Whereupon the hearing was adjourned at 5:00 p.m., to be reconvened on Tuesday, May 7, 1991, at 10:00 a.m.

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